







THE INTERNATIONAL
PHYTOGEOGRAPHICAL EXCURSION
IN THE
BRITISH ISLES
(1911)

A RECORD AND SOME NOTES
BY VARIOUS PHYTOGEOGRAPHERS WHO TOOK PART
IN THE EXCURSION

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PREFACE.

THE papers contained in this little volume are reprinted from the NEW PHYTOLOGIST, Vols. X and XI, 1911-12, in order to form a permanent record of the first international phytogeographical excursion which has been organised independently of any congress or other meeting, with the single intention of affording opportunity for joint observation and discussion between phytogeographers of different nations.

The editor was fortunate in obtaining a contribution from every member of the international party, and the collected papers form a distinctly valuable body of information and opinion.

The floristic side of the excursion occupies a good deal more space than was originally contemplated. This is due simply to the more advanced state of development of floristic as contrasted with ecological plant-geography, and the consequent greater ease of comparison between Continental and British species and varieties, than between Continental and British plant-communities.

On the purely vegetational side, however, there is no doubt from their published remarks that the leading Continental plant-geographers have learned a great deal from this rapid survey of British vegetation, nor can it be questioned that British ecologists are profiting from their foreign colleagues' impressions of British ecological conditions and criticisms of British synecological conceptions.

With regard to these last it has appeared to the present writer premature to attempt either a revision or a defence of British synecological concepts and nomenclature. The general relations of British vegetation to that of Central Europe are admirably and most instructively dealt with in the papers of Professor Drude and of Professor Schröter.

For these reasons no summary of the ecological, as opposed to the floristic, results of the Excursion appears in the present volume. But that these results will be exceedingly fruitful in leading to clearer understanding and eventually to universally acceptable concepts may be confidently asserted. The magnificent American tour arranged by Professors Clements and Cowles for the coming summer may be expected to bring us yet nearer to our common goal.

It only remains for the present writer to thank in the most cordial way all the contributors to this record, and to express his unalloyed satisfaction with the results, from every standpoint, of the Excursion—results which far more than repay the effort devoted to it.

GRANTCHESTER,
CAMBRIDGE.
February, 1913.

A. G. TANSLEY.

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THE INTERNATIONAL PHYTOGEOGRAPHICAL EXCURSION IN THE BRITISH ISLES.

I. THE INCEPTION OF THE EXCURSION.

THE study of Phytogeography, from the very nature of the material with which it deals, demands a comparison of the flora and vegetation of different parts of the earth's surface, and this is equally true of the floristic side, which is concerned with the distribution of species, and of the ecological side, which deals with the distribution of vegetation, *i.e.*, of plant-communities. Floristic botanists, owing to limitations of time and money, largely depend for their material upon herbaria-collections of dried plants from different parts of the world. In times past at any rate, many of the most eminent are said to have been almost unable to recognise living plants of species with which they were perfectly familiar in the herbarium, and it is notorious that by far the larger number of diagnoses of species are founded upon dried material alone. The divorce of the study of systematic botany from the study of plants as living organisms thus resulting, has very often been recognised and deplored. There is no need to labour the point again. The formation and study of herbaria are of course essential, and even apart from limitations of time and space, could never be wholly replaced by personal investigation in the field and laboratory. But it will be very generally admitted that the systematic botanist who spends little time in the field and never becomes thoroughly acquainted with living plants at first hand must necessarily be ill-equipped for his task. Of course very many systematists actively pursue, and always have actively pursued, their studies in the field, both in their own and in other countries. Important light is always thrown on the flora of a country by the study of the floras of the neighbouring countries, and indeed such study is essential to its proper understanding. Hitherto no mechanism has existed for the investigation of a flora by botanists from neighbouring countries in company with native botanists. Isolated visits to this end have no doubt been frequent, but carefully organised international excursions have hardly existed, except indeed incidentally in connexion with international congresses. In recent years the most important of these have been organised in connexion with the International Congress of

Botanists at Vienna in 1905, the International Congress of Geography at Geneva in 1908, and the International Congress of Botanists at Brussels in 1910.

The Swiss botanists are particularly energetic and successful in organising botanical excursions in connexion with their botanical curricula; they regard such excursions as an essential part of the training of their own students; and they always welcome the presence of foreigners in the kindest way, and do everything that enthusiasm and the utmost goodwill can suggest to facilitate the study of their beautiful native vegetation. Nor have they confined their efforts entirely to the needs of their own students or to their own country. The excursion through Switzerland in connexion with the International Congress of Geography at Geneva in 1908, organised and conducted by Professor Schröter of Zürich, was in all respects a model of what an international excursion should be, and suggested to the present writer the idea of a similar excursion in the British Isles, which has been carried out this year, and is the occasion of the present article. The Swiss excursion of 1908 was attended by Professor Flahault of Montpellier, by Dr. and Frau von Hayek of Vienna, by Dr. Ostenfeld of Copenhagen, by Professor Rothert of Odessa, by Dr. Scharfetter of Villach and by the present writer, as well as by several Swiss botanists under the leadership of Professor Schröter and Dr. E. Rübel of Zürich. It lasted eleven days, during which Mount Pilatus, the Sihltal at Einsiedeln, the lakes of the Canton Ticino and the neighbouring part of Italy, the Bernina region, and the neighbourhood of St. Moritz in the Engadine were visited. In writing of the work of the Swiss in this connexion mention should be made of the "Naturwissenschaftliche Studienreise" organised by Professor Rikli of Zürich in the spring of every alternate year. Visits have been made to the Balearic Islands, to Madeira and the Iberian peninsula, and in the spring of 1910, to Algeria. Next summer there is to be an expedition to the South Russian steppes and to the Caucasus. These expeditions, intended primarily for the students of the Federal Polytechnic at Zürich, are nevertheless open to foreigners and others who have some definite scientific object to pursue, and are most useful in affording opportunities of visiting various places in Southern Europe and neighbouring regions at a minimum of cost, and in company with fellow-workers. The object of these excursions is not however primarily botanical, but includes geology, zoology, ethnology and so on, though the interests of plant-geographers play a considerable

part in the choice of route and in the general arrangements. Professor Chodat of Geneva, also conducts distant excursions for his students once or twice a year.

The rise and spread of the study of vegetation which has been so marked a feature of recent years, demands, even more urgently than floristic botany, the organisation of expeditions of this kind. While the student of the distribution of species can depend more or less on herbaria and on floras, which at least give him systematised, though often inadequate, information as to the species of plants which occur in other countries, the student of the distribution, structure, relationships and development of plant-communities has to depend upon published descriptions and photographs of vegetation, which, even at the best, do not convey to him an idea of the phenomena involved in any way comparable with that which he can obtain on the spot, especially with the assistance of botanists who have actually studied the vegetation in question. In the present somewhat rudimentary state of evolution of the concepts and corresponding language of ecological plant-geography, this difficulty of obtaining clear and definite ideas of the vegetation of other countries without visiting them is necessarily very great. Workers in different countries use different names for the same thing and the same name for different things; they are frequently not at one as to the fundamental *differentia* of the units they employ. When we add to the difficulties arising on this score the fact that while vegetation all over the earth has, beyond question, fundamental similarities in regard to its structure, differentiation and relation to habitat, yet these similarities are greatly obscured by certain peculiarities of climate, soil, and floristic distribution, and even more by the results of the long-continued activity of man in the countries which have an old civilisation, it is not surprising that, with the best will in the world, keen students of vegetation in different countries should often altogether misunderstand one another's writings.

To overcome such difficulties much patience and determination and frequent interchange of visits are absolutely essential. It was with the object of making a definite beginning in this direction that the British Vegetation Committee, at the suggestion of the present writer, decided, in December, 1908, to attempt to organise an international excursion in the British Islands, "than which" to quote the words of the preliminary circular issued in January, 1910, "it is believed there is no easily accessible European country less

known to Continental plant-geographers." After a good deal of preliminary correspondence and discussion as to the most suitable date, it was decided, in December, 1909, to fix on the month of August, 1911, and a rough outline of the places to be visited was drawn up and embodied in the circular referred to. The purpose of the excursion was defined as that "of visiting under the guidance of botanists who have specially studied them, the principal types of vegetation to be met with in the British Isles." Thus, in accordance with the objects which the British Vegetation Committee exists to promote, the aim of the excursion was defined as ecological rather than floristic. It was also decided that the size of the party must be strictly limited, so that no public announcement was made, but the preliminary circular took the form of an invitation addressed to a selected list of foreign plant-geographers of distinction. The response was unexpectedly unanimous. With one exception all the botanists addressed provisionally accepted the invitation, and it thus became clear that the excursion would certainly not fail from lack of support. Later on, however, after the issue of a fuller programme in March, 1911, several of those who had provisionally accepted found that they would be prevented from coming by circumstances which had arisen since their original acceptance, and accordingly invitations were sent to others. At the last moment Professor Warming was kept at home by serious illness, from which all ecologists will be glad to learn that he has now happily completely recovered, Dr. Weber by unexpected circumstances and Professor Flahault by domestic considerations. It was with the greatest regret that the Committee learned that these three distinguished men could not after all be present, for to none more than to Professors Warming and Flahault does the recent growth of British ecology owe its stimulus and inspiration, while the absence of Dr. Weber from an expedition through a country possessing such extensive peat deposits as the British Isles, was certainly a very serious loss. The party eventually consisted of eleven foreign guests, about the number which was originally contemplated: Professor and Mrs. Clements of Minneapolis, Professor and Mrs. Cowles of Chicago, Professor Drude of Dresden, Professor Graebner of Berlin, Professor Lindman of Stockholm, Professor Massart of Brussels, Dr. Ostenfeld of Copenhagen, and Dr. Rübel and Professor Schröter of Zürich. Besides these Mr. G. Claridge Druce of Oxford, representing British floristic botany, was present during the whole tour, and various members of the

Committee accompanied the party during different portions of it, the local guides being in nearly every case those members who had carried out special studies on the vegetation visited. The present writer, who acted as general director of the tour, accompanied the party throughout. The number of the party varied between fourteen and twenty-two. The tour lasted four weeks, and a fifth week was spent at Portsmouth during the meeting of the British Association.

The scheme of the Committee included an attempt to supply the foreign visitors with information designed to enable them to obtain the greatest possible result from the tour. In the first place a book was prepared, under the editorship of the present writer, giving a systematic account of the vegetation of the British Isles.¹ The sections dealing with the different types of vegetation were in nearly every case illustrated by descriptions of the areas to be visited on the excursion, written by members of the Committee who had studied these areas. A copy of the book was presented to each foreign member of the party. A pamphlet of 32 pages was also prepared, containing "Descriptive Notes on the Topographical and Geological Features and on the Vegetation of the Route" written by the different local guides and containing full references to *Types of British Vegetation* and other relevant literature. Owing to great pressure of work involved in preparing the book and organising the excursion the editing of these "Descriptive Notes" left something to be desired, and the notes were not all they might have been in the way of uniformity and completeness. Finally a "Business Programme," containing general information, a skeleton programme of the tour, with names of Hotels, times of trains, etc., a map of the route and a list of members of the party, was prepared, and this was certainly of great use. The departures from the programme indicated were very slight.

Some permanent published record of the tour seems required, and an outline account of the doings of the party is subjoined. In the next number of this journal an account of the "Floristic Results of the Excursion" by Mr. G. Claridge Druce will appear, and in subsequent numbers it is hoped to publish some impressions by various foreign members of the party.

¹ Recently published by the Cambridge University Press under the title of *Types of British Vegetation*. Price 6/- net.

II. DETAILS OF THE EXCURSION.

The party assembled in Cambridge on Tuesday, August 1st. The morning was spent at the Botany School, and lunch was taken in the hall of Emmanuel College by permission of the Master and Fellows. The afternoon was spent at the Botanic Garden, round which the party were conducted by the Curator. Afterwards Dr. Moss demonstrated the numerous species and varieties of *Ulmus*, on which he had recently been working, to be met with in the Backs.

On the morning of Wednesday, August 2nd the party met on Sheep's Green and spent some time examining the riverside and submerged vegetation of the Cam, where the submerged forms of many of the common riverside plants were specially noted. The river was then ascended in punts and canoes as far as Grantchester, where the party were entertained at lunch by Mr. and Mrs. Tansley. In the afternoon some of the Colleges were visited and in the evening a dinner was given by Professor Seward and Mr. Blackman in the Combination Room of St. John's College.

A very early start was made on August 3rd, the party leaving Cambridge by the 6.45 train for Norwich and Brundall, where it was joined by Miss M. Pallis, who is engaged in a very thorough study of East Norfolk vegetation, and who acted as local guide. The much shrunken remnants of Surlingham Broad, situated in a bend of the River Yare, were first visited by boat. The old Ordnance Map published in 1838 shows this broad as a wide sheet of water. The aquatic vegetation, the reedswamp and fen are all characteristic of the Yare valley type. The broad is strongly affected by the rise and fall of the tide so that the "hover" or floating reedswamp dominated by *Glyceria aquatica* sometimes rests on the muddy bottom and sometimes floats over three or four feet of water. The fen and incipient "carr" (fen wood) with its considerable variety of shrubs were cursorily inspected. The party then returned to Brundall, proceeded by train to Buckenham, and after lunch at the Buckenham Ferry Hotel visited Rockland Broad, also by boat. Rockland Broad is the last broad in the valley of the Yare. Here very fine swamp carr (woodland which has established itself on reedswamp) was visited, and the absolutely natural condition of this type of vegetation greatly pleased the members of the party. Professor Massart obtained some excellent photographs. There was some discussion as to the rôle of *Phragmites vulgaris* in relation to fen and reedswamp. After returning to Buckenham the party took train to Yarmouth, passing across considerable tracts of pasture developed on loam and probably occupying the site of saltmarsh which originally developed in the old estuary of the Yare. Supper was taken in Yarmouth and the party then proceeded by train to Hemsby and Sutton, where the night was spent.

On Friday morning Sutton and Barton Broads (belonging to the River Ant) were visited in boats. The distinctive feature of this system of broads is the widespread association of *Scirpus lacustris* and rooted "floating-leaf" aquatics. Professor Cowles remarked on the great similarity of this vegetation to certain North American aquatic vegetation, the plant-forms, the genera and even many of the species being identical. The aquatic association of

Stratiotes Aloides is also remarkable, occupying a large extent of Barton Broad. These aquatic associations are rapidly filling up the broads, which are, however, kept partially clear by cutting. Heron's Carr, a very finely developed swamp carr to the south-west of Barton Broad was next visited. It contains very finely developed ferns, *Osmunda regalis*, *Athyrium Filix-femina*, etc.: the abundance of *Iris Pseudacorus* (which does not flower) is also characteristic, and species of *Ribes* are abundant. Fen carr was observed in process of forming on the outskirts of Heron's Carr. The fen itself is of the Bure valley type and societies of *Sphagnum* and *Drosera intermedia* occur here and there.

Owing to the kindness of Mr. Robert Gurney some of the party were accommodated at his laboratory on Sutton Broad, and the whole party were entertained to tea there by Mrs. Gurney and himself. Mr. Gurney also generously offered to put the whole party up at his laboratory, house, and cottages, but it was not necessary to trespass on his kindness so far, as accommodation was available in Sutton village.

On the morning of August 5th the party travelled to Potter Heigham on the Thurne and inspected a small development of "Hochmoor" with *Sphagnum*, *Polytrichum commune*, *Eriophorum angustifolium*, *Calluna vulgaris*, *Erica Tetralix*, *Drosera rotundifolia*, etc. on the edge of the fen. The party afterwards embarked on a motor-launch at Heigham Bridge and ascended the River Thurne, turning up Candle Dyke to Heigham Sound, with its fine marginal reedswamps dominated by *Typha angustifolia*, and Hickling Broad. *Naias marina* was gathered from its only recorded locality in the British Isles, and then the launch proceeded up the Meadow Dyke to Horsey Mere, stopping on the way to visit Blackfleet Broad, now a small patch of water almost isolated in the fen. The fen surrounding this broad interested the party considerably. It is of brackish type with *Œnanthe Lachenalii*, etc. *Lastrea cristata* occurs here as well as societies of *Sphagnum* on tussocks of *Phragmites*. In Horsey Mere itself *Lychnothamnus stelliger* was gathered. The water of the whole of this series of broads is more or less brackish, and has an interesting plankton very poor in species but containing some marine or brackish water Diatoms, while such plants as *Cochlearia officinalis*, *Plantago maritima*, *Scirpus maritimus* and *Triglochin maritimum* are scattered through the district. After leaving Heigham Sound the launch proceeded down the Thurne into the Bure and up as far as Horning. Opposite the Church the party disembarked to inspect typical Bure Valley fen and well developed fen carr. Then the launch continued to Woodbastwick Old Hall, where Mrs. Barclay entertained the party to tea. Hoveton Great Broad was then visited in boats in company with Mrs. Barclay, and an attempt was made to enter a small broad connected with the Great Broad where swamp carr is very finely developed in connexion with tussock swamp of *Carex paniculata* and *C. acutiformis*, but owing to the shallowness of the water and to the fact that very little time was available the attempt had to be abandoned. The launch then continued to Wroxham, past the abundant carrs developed on the fenland of this region of the Bure valley. The train was then taken to Cromer, and after supper, the party proceeded to Holt, where the night was spent.

On Sunday, August 6th the day was spent among the maritime formations of Blakeney Harbour, under the guidance of Professor F. W. Oliver. The main feature of interest here is the great shingle bank which stretches for miles along the coast and protects the estuary of the Glaven (Blakeney Harbour) in which salt-marsh vegetation has developed. Lateral shingle beaches stretch landward from the main bank, and represent successive inwardly turned terminations of the main bank, which has gradually extended westwards along the coast. In the bays enclosed by these lateral banks successive stages in the development of salt-marsh formation, from the open association of *Salicornia europaea* with unrooted *Pelvetia canaliculata* to the general salt-marsh association. On the shingle beach itself *Suaeda fruticosa*, which often forms dense thickets two feet or more high, flourishes abundantly. This is apparently its most northerly station in the British Isles. *Arenaria peploides*, *Silene maritima* and *Rumex crispus* var. *trigranulatus* are the other plants which are most abundant on the shingle-beach, while *Mertensia maritima*, the Oyster-plant, with its fleshy leaves simulating pebbles here occurs at the southern extremity of its range on the east coast. *Limonium bellidifolium* (*Statice reticulata*) occurs where mud has been deposited on the shingle and *Limonium binervosum* in other places. Sand dunes have accumulated in places on the top of the shingle, and the process of the formation of these by the accumulation of sand round seedling plants of *Ammophila arenaria* can be observed. After lunch at Blakeney Point, the party sailed across on the high tide to Blakeney, and drove from there to Morston. From here Stiffkey salt-marshes and "meols" (sand dunes) were visited on foot, and the associations of *Glyceria maritima* and *Juncus maritimus* (later developments of the salt-marsh formation not to be observed in Blakeney Harbour itself) were observed. A beautiful example of the gradual destruction of the *Glyceria*-association by wave erosion occurs here. In the evening the party drove back to Holt.

On Monday morning, August 7th, the party travelled from Holt to Derbyshire, obtaining a good idea of the general features of East Anglia and the Midlands en route. The railway passed at first over the varied, generally light soils overlying the chalk of West Norfolk and then across the drained and cultivated Marshland and Fenland south of the Wash. At Peterborough the Fenland was left and the rolling Jurassic clays of the east Midlands with their abundant pasture, now much browned by the long drought, and occasional oak-hazel woods, entered upon. Changing at Leicester much the same type of country, in the valleys of the Trent and its tributaries, was passed through, till the great massif of the Southern Pennines was entered near Belper. Along the course of the Derwent valley the Mountain limestone lay to the west, and the siliceous rocks of the Coal Measures and Millstone Grit with extensive areas of moorland to the east. At Miller's Dale station the party alighted and drove to Litton on the limestone plateau, walking thence down Cressbrook Dale to Monsal Dale under the guidance of Dr. Moss. In Cressbrook Dale limestone pasture, limestone scrub and ashwood were successively passed through, and much discussion took place as to the true relationships and status of these communities. On the limestone

scree were extensive sheets of *Convallaria majalis*. After tea at Monsal Dale, the party drove to Miller's Dale station, and took train to Manchester.

The next three nights were spent at the Midland Hotel, Manchester, where the party was joined by Professor Graebner.

On August 8th a traverse across the moors from Crowden to Greenfield was made. The sides of Crowden Great Clough were covered by siliceous grassland with much *Pteris aquilina*, and a few trees of *Quercus sessiliflora*, *Betula tomentosa* and *Pyrus Aucuparia* in the lateral valleys. The edge of the moors which occupy the peat-covered plateau is very sharp. Blackchew Head moor is largely covered with an association of *Eriophorum vaginatum*, but a good deal of it is much cut up by channels through the peat, and on the drying hags is abundant *Vaccinium Myrtillus*, *Empetrum nigrum* and sheets of *Rubus Chamænorus*. An extensive new reservoir is being made at the head of Chewbrook Clough and a considerable extent of the valley is devastated. In the evening the party was entertained to dinner at the Midland Hotel by Professor Weiss and Professor Lang.

August 9th was devoted to an excursion to the moors and woods lying to the south of Huddersfield. Owing to the kind offices of Dr. Woodhead some of the members of "the Cave," the oldest club in Huddersfield, generously lent several motor cars for the use of the party, and in this way a great deal of ground was covered most comfortably on this, the hottest day of a memorable summer. The party was met at Greenfield station by the cars and taken at once up over Saddleworth moor, very typical moor of *Eriophorum vaginatum*, so characteristic of the Pennine plateaux. The peat was now exceptionally dry and cracked in many places. Some interesting peat-sections with buried birch were examined, and again the siliceous pasture of the valley sides with continuous belts of *Pteris*, especially towards their upper edges were seen to stand out clearly against the peat-covered plateaux. The cars then proceeded to Honley where the party were most graciously entertained at lunch by Miss Siddon. After lunch Honley Woods of *Quercus sessiliflora* accompanied by Birch with an undergrowth of *Calluna*, *Vaccinium Myrtillus*, *Deschampsia flexuosa*, etc., passing into *Calluna* heath were visited, and afterwards Hey Wood and Woodsome Woods, with the ground vegetation (on the Lower Coal Measures) mainly composed of *Holcus mollis*, *Pteris aquilina* and *Scilla non-scripta*, except in the damper places where there is a more varied vegetation. At Woodsome Wood the party were given tea by Mrs. Woodhead, and afterwards visited Woodsome Hall by permission of Lord Dartmouth, whose agent kindly opened it for the purpose of showing the members of the party the beautiful old court and hall and Renaissance terrace. From Woodsome Hall the party quickly reached Huddersfield, where they were entertained at dinner by the President and members of "the Cave" at a local hotel. The warm-hearted hospitality of their Huddersfield hosts will always be remembered with special pleasure of the party.

On the morning of August 10th the party left Manchester for Southport and Ainsdale to visit the extensive Lancashire sand dunes under the leadership of Professor Weiss and Mr. Ball (of

Southport). From Ainsdale the members walked down to the sea-shore and along the front of the dunes, where the association of *Agropyron junceum* on the low dunes was inspected. Very few genuine strand-plants occur, this association being represented almost solely by *Salsola Kali*. Passing across the frequently wind-eroded *Anemone*-dunes behind, the party entered the region of the "slack" or dune valleys, the extensive development of which is a characteristic feature of these dunes. *Salix repens* is a striking feature of the slacks and accumulates numerous secondary dunes. The slacks were bright with the large flowers of *Parnassia palustris*, and *Pyrola rotundifolia* was abundant in the drier examples of the association of *Salix repens*. Many interesting plants were found in the slacks, but unfortunately the drought had caused the temporary disappearance of many of the interesting Bryophytes, and in the absence of Mr. Wheldon, who was to have joined the party, but was unfortunately prevented from doing so, little was seen of the particularly interesting Bryophyte vegetation of the dune slacks. *Viola Curtissii*, and several forms of *Oenothera* were found near Birkdale. In the evening the party proceeded by train to Preston and Lancaster, where they were met by Mr. W. M. Rankin, under whose guidance the next two days were spent.

August 11th was spent in the limestone district of Silverdale, where much of the country is covered with ash-oak wood. In the basin of the old "Burton Lake," now long since vanished, the lowland moor developed on peat was visited. The peat has been extensively removed and little or no untouched moor is left, but various stages of the recolonisation of the peat-bog vegetation were observed. An excellent peat section, which Mr. Rankin had specially re-dug for the benefit of the party, was examined. The section showed a very interesting succession of vegetation. "Moor peat" composed of *Sphagnum*, *Eriophorum* and *Calluna* was underlaid by a layer of birch *in situ*, and this by peat composed of the remains of *Cladium* and *Phragmites*. Below the sedge-peat a layer of *Hypnum*, and then of amorphous peat, rested on shell marl, evidently deposited on the floor of the ancient lake. The whole sequence told the story of the obliteration of the lake by fen, the growth of a birchwood upon the fen, and the subsequent destruction of the wood by a *Sphagnum*-bog. The succession is strikingly similar to those described by Weber and other continental authorities on peat. The party afterwards visited Haweswater, a small existing lake with good reedswamp on the sheltered side, and bare banks where they are exposed to wind and wave action. Adjoining the lake is limestone bog with *Primula farinosa*, *Selaginella selaginoides*, etc. Some of the party examined a salt-marsh near Arnside, which Professor Oliver reported as exhibiting very interesting features. Lancaster Castle was visited in the evening by special permission of the Constable.

On August 12th the party travelled to Grange and drove to Foulshaw Moss, a comparatively untouched lowland moor with an existing vegetation of *Eriophorum vaginatum*, mixed with *Scirpus cæspitosus*, over most of its extent. There is historical evidence that this "moss" was comparatively recently much wetter than it now is, and no doubt largely occupied by *Sphagnum*. The drying

of the moss still continues, but is largely aided by peat cutting; the parts most affected bear a mixture of *Eriophorum* and *Calluna* and are eventually colonised by birch and Scots pine from neighbouring woods and plantations. Thus by the time the *Eriophorum* has disappeared regular birchwood is formed, with pine, mountain ash, yew, sallows, etc., and in places a ground vegetation of *Molinia*, *Vaccinium*, etc. The wetter parts of the moor are still occupied by *Sphagnum*-bog. Sections of the peat show a very similar sequence to that of the "Burton Lake" peat, except that the upper *Sphagnum*-peat passes up into a thin layer of *Eriophorum*-peat on which grows the existing *Eriophoretum*, while below, the fen peat is separated from the *Sphagnum*-peat by birch and pine *in situ* and is based on an estuarine silt containing the roots of trees. Here then we have two complete successions, that of the fen and that of the moor, each culminating in a wood-association, while the remains of a very ancient wood destroyed by the growth of the fen is found at the extreme base. The remains of an ancient "corduroy road" consisting of logs placed transversely occur in the midst of the *Sphagnum*-peat. Mr. Rankin's excellent work on these lowland moors was the subject of general congratulation. A brief account appears in *Types of British Vegetation*, but it is to be hoped that a fuller account will shortly be published. The party afterwards visited the gardens of Levens Hall with its famous topiary work, and in the evening travelled from Oxenholme to Penrith, where they were met by Dr. F. J. Lewis.

On Sunday, August 13th, an early start was made for Crossfell, the party driving to Kirkland at the foot of the mountain. The Crossfell ridge consists of alternating bands of gently inclined limestones, flags and grits. The western escarpment is formed of a series of terraces, the steps being formed of limestone, free from peat, and covered by a thin soil forming typical limestone grassland with *Festuca ovina*, *Sesleria cærulea*, *Agrostis vulgaris*, *Kæleria cristata*, *Poa pratensis*, and various "calcicole" plants. The sandstones and flags form slightly inclined platforms between the steps, and are covered with siliceous grassland, largely dominated by *Nardus stricta* and *Juncus squarrosus*, with stunted moor plants such as *Calluna*, *Vaccinium Myrtillus*, etc., in places where there is a distinct accumulation of peat. On the western side of Cross Fell itself there is no extensive moorland association, but on adjoining parts of the ridge, moor comes down to an altitude of about 600 metres. Dr. Lewis is, however, of opinion that the whole western face of the range was at one time covered with peat, that the local patches of peat on the western side of Cross Fell are the remains of this extensive mantle, and that the cause of its disappearance is probably to be found in the increasing dryness of the climate. He sees evidence for this view in the widespread degeneration of the moor formation throughout the British Isles, as shown by the occurrence of "retrogressive moor" (a term due to Dr. Moss, who does not, however, assign its origin to a change of climate) on many high plateaux. This retrogressive moor is characterised by the erosion of the peat and by the constant occurrence of *Vaccinium Myrtillus*, *Empetrum nigrum* and *Rubus Chamæorus* on the hags between the erosion channels. The association occurs on the hills

adjoining Cross Fell itself and on the undulating plateau lying to the east. Other moor associations represented in this area are Eriophoro-Callunetum, a frequent transition, on the Pennines, between cottongrass moor and heather moor, and pure cottongrass moor, here characterised by dominance of *Eriophorum angustifolium*, in place of *E. vaginatum*, the dominant of the typical cottongrass moors of the Southern Pennines.

After ascending to the summit of Cross Fell, which is occupied by a small area of alpine plateau characterised by weathered hummocks of *Rhacomitrium lanuginosum* and by the presence of *Carex rigida*, but, in general, extremely bare of plants, alpine or otherwise, the party traversed the eastern moorland as far as the Lambgreen Hills, which form abrupt slopes of drift limestone rising out of the moorland. The contrast between the limestone grassland of these slopes and the adjacent moor association is very sharp and striking. One can literally step from one to the other. The peat of the moor close to the Lambgreens is extensively denuded and in the stretches of bare peat between the hags the remains of a regular birch forest are exposed, the white bases of the trunks and spreading roots forming a striking feature. This old birch forest is at an altitude of over 2,000 feet (600 metres). The barenness of the peat in this region is attributed by Dr. Lewis to denudation, but Professor Graebner was of opinion that it was due to a "bog-burst." In the evening the party drove back to Penrith, where the night was spent.

On August 14th the train was taken to Carlisle and thence by the North British route, via Hawick, to Edinburgh. This route gives an excellent general idea of the Southern Uplands of Scotland and very careful descriptive notes had been prepared by Dr. W. G. Smith. The extraordinary poverty in natural or semi-natural woodland, sufficiently marked in much of northern England, is even more striking in this traverse of the Southern Uplands. Edinburgh was reached at 3 o'clock, and shortly afterwards the party visited the Royal Botanic Gardens by invitation of Professor Bayley Balfour, who conducted the party through most of the Gardens and houses. The alpine department and the cultivation of the heaths were much admired. In the evening Professor Balfour entertained the whole party to dinner at Inverleith House, where haggis and grouse formed part of the *ménú*.

The morning of August 15th was spent in visiting Edinburgh Castle and other places of interest in the city, and in the afternoon the party left for Dunkeld. Dr. Smith again supplied careful notes on the route. At Perth, which was reached at 3.23, the Museum was visited and the collections inspected, including a collection of Scottish arctic-alpine plants specially selected for the occasion. Perth was left at 7.15 and Dunkeld reached at 7.42. In the evening a Highland piper entertained the party, but the music of the pipes was not equally appreciated by all the members.

On August 16th a half-day was spent round the lochs and in the woods north of Dunkeld. The woodlands included examples of good typical wood of *Quercus sessiliflora*, but much has been replanted at different periods. Round Cally Loch are many exotic deciduous

trees, while in the Loch itself *Aponogeton* and *Nymphaea candida* grow profusely. In the older plantations of Scots Pine, tall clumps of Juniper were conspicuous in open parts, while the usual ground vegetation on dry humus included, with *Calluna*, *Vaccinium*, etc., *Trientalis europaea*, so characteristic of old woods in this district. Further off on the hills were seen the woods of Larch extensively planted on the Atholl estate over 100 years ago. On the lochs special facilities were granted by the Marquis of Tullibardine; boats were available and some members examined the aquatic vegetation of these lochs of the "Highland" type. *Lobelia Dortmanna* was abundant, while *Isoetes lacustris*, *Naias flexilis* and other representative species were collected. On the shores of Butterston Loch the party passed through a swamp of *Alnus* with *Myrica* and *Juniperus*, fringed on the landward side by abundant *Rosa spinosissima*. The grounds of Dunkeld House were afterwards visited and the party were photographed round the stump of the oldest larch in the British Isles which was planted in 1738, shortly after the introduction of the tree and was killed by lightning in 1906; it clearly shows more than 160 rings. Dunkeld and its neighbourhood possess a large number of interesting exotic conifers many of which were planted shortly after their introduction to Europe, and these greatly interested the foreign visitors. In the afternoon the party travelled from Dunkeld to Aberfeldy and drove thence to Fearnan and Lawers village, on Loch Tay, where the night was spent.

The following day, August 17th, the ascent of Ben Lawers was made, the party being joined by Professor Bayley Balfour, who had travelled from Edinburgh for the purpose. The route by the Carie Burn was taken, and the following zones of vegetation were recognised, following Dr. W. G. Smith's recent account in *Types of British Vegetation*. First the enclosed pastures whose vegetation has been influenced by the manuring incidental to pasturage, extending from Loch Tay to a height of about 1,000 feet; then unenclosed sheep pastures extending as far as the first ridge of moraines (1,500—1,750 feet) and dotted with heather in places. The unenclosed pasture passes, on the flat undulating ground between the low ridge and Lawers itself, into the grass-moor, which is dominated by *Nardus stricta* and *Juncus squarrosus* on peat. The grass-moor runs a considerable distance up the slope of Ben Lawers itself and at a height of about 2,250 or 2,500 feet gives place to the first strictly arctic-alpine association, dominated by *Alchemilla alpina* and various grasses, such as *Festuca ovina*, *F. rubra*, and *F. vivipara*, *Deshampsia flexuosa*, and forms of *Poa alpina* ((2,500–3,500 feet). This is apparently the culminating association on well drained talus slopes. Above this we came to the arctic-alpine chomophyte associations of the ledges and fissures of the corries south-west of the summit, which were reached by leaving the course of the burn and striking obliquely up the slopes covered by the *Alchemilla alpina* association. Above the corries the summit plateau is covered by the plant-formation of mountain-top detritus in which mosses and lichens, and notably *Racomitrium lanuginosum*, are the pioneer and, in the more exposed places, always the leading plants. The Swiss botanists recognised in those black crusted tracts and patches so characteristic of the summit region, the "schneetälchen" of

Switzerland, with the liverwort *Anthelia Juratzkana* forming the first coloniser of the snow-washed soil, accompanied by the characteristic *Gnaphalium supinum*, and the orange lichen *Solorina crocea*. The "Saxifraga ceruua corrie" proved most interesting and during the descent Professor Balfour pointed out an extensive association of *Fucus trifidus* competing with the intruding *Alchemilla alpina* pasture association. The more interesting arctic-alpine species, of which a considerable number were found in flower, will be alluded to in Mr. Druce's account of the floristic results of the expedition. After reaching the summit most of the party explored the cliffs above Lochan 'a Chat, and crossed the extensive and partially denuded peat-deposits to the east of the summit, gathering *Cornus suecica* in the *Vaccinium Myrtillus-Empetrum nigrum* association at about 3,000 feet. The whole party met at the Lawers Hotel for tea between 5 and 6 o'clock. Professor Massart obtained a number of excellent photographs of the arctic-alpine associations.

On August 18th the early steamertook the party to Killin pier, and thence by train through Glen Ogil and by Loch Earn to Callander. After an early lunch the party drove to the Trossachs, and after walking a little way along the shores of Loch Katrine, turned back through the wood to Loch Achray. This wood proved to be a very beautiful and typical example of a *Quercus sessiliflora* wood with heathy ground vegetation, a type so common on the old siliceous rocks of northern and western Britain. A few plants belonging to the non-heathy type, e.g., *Scilla non-scripta*, occurred here and there. On the cliffs to the north the characteristic zonation of oak below and birch above was well seen. The party returned to Callander, where the night was spent.

On the morning of August 19th the party travelled to Glasgow, and after a brief view of the Town Hall, etc., went straight to the Botanic Garden, where Dr. Lawson kindly showed the well-known moss-house. The Botanical Institute was afterwards visited, and then Professor Bower, who was not fully recovered from a sprained knee and came over from his house on crutches, entertained the party to lunch at the Students' Union. The afternoon was spent at the Glasgow Exhibition where the historical and particularly the "prehistorical" section greatly interested the party. In the evening the party left for Greenock where they embarked for Dublin.

On the morning of Sunday, August 20th, after a smooth passage, the party arrived in Dublin and were met on the quay by Mr. Lloyd Praeger, who had organised with his usual care and thoroughness the Irish portion of the tour, and who acted as guide throughout Ireland. The Botanic Garden of Trinity College was visited in the forenoon under the guidance of Professor H. H. Dixon, while in the afternoon the Glasnevin Gardens were visited by most of the party, a few members going instead to the sand dunes and salt marshes of the North Bull.

On August 21st the party left Broadstone station by the west-bound mail at 7 a.m., and travelled right across Ireland to Clifden, Co. Galway, where the afternoon was spent on the hillsides on the north of Clifden Bay. The constant association of *Ulex Gallii*, *Dactyloctenium polifolia* and *Erica cinerea* in clumps scattered in the

grassland was the most striking vegetational feature. Several interesting western plants were found. The magnificent roadside bushes of *Fuchsia Riccartoni* (quite naturalised and said to reproduce itself from seed, though no undoubtedly self-sown seedlings were seen in the neighbourhood of Clifden) were much admired. In the evening the small laboratory of the Irish Department of Agriculture, in which much good work on the diseases and manuring of the local crops is being done by Dr. G. H. Pethybridge and his assistant, was visited.

On August 22nd cars were taken to Craigga More. *Eriocaulon septangulare*, the most abundant of the American plants found in West Ireland, was seen in abundance in several roadside pools. Near Craigga More Lough plenty of *Erica Mackaii* was found, replacing *Erica Tetralix*, and on the islands in the lough the dwarf woods sheltering a woodland vegetation were visited (see NEW PHYTOLOGIST, Vol. VIII, pp. 253-5), while other members of the party cursorily examined the adjacent moors. The drive was then continued to Roundstone, whence, after a meal, Urrisbeg was ascended; from the top a splendid view is obtained of the surrounding country: on the north the typical Connemara moors, studded with innumerable lakelets and with the rounded summits of the Twelve Beinns behind, on the east the greatly indented inlets of Roundstone Bay with their seaweed-covered rocks running far up into the moorland; to the south the characteristic limestone hills of the Burren in Co. Clare across the broad expanse of Galway Bay. An interesting discussion on the geology of this district, which has been entirely and strongly glaciated, and on the origin of the peat-covering, took place on the summit of the hill. *Ulex Gallii*, again associated with *Daboecia* and *Erica cinerea* was particularly finely in flower on Urrisbeg, which like the shores of Clifden Bay is marked by alternation of heath with grassland. *Spiranthes autumnalis* was abundant in the turf. The party then descended the hill on the south side and visited the much denuded sand dunes of Dog's Bay. These furnish a capital example of degeneration of a habitat. The dunes have passed through the stage of fixed dune grassland, of which some few tracts still remain, with *Eryngium maritimum* and *Euphrasia curta*, but most of the turf has been destroyed and bare sand remains. Here and there small dunes are being slightly regenerated, through the agency of such plants as *Carex arenaria*, *Agropyron junceum*, and, in places, *Potentilla anserina*. *Ammophila* is very scanty and what there is seems to have remained from an earlier period when the dunes were in a primary phase of development. *Salsola Kali*, *Arcuaria pectoides*, *Polygonum Raitii* and *Spergularia rupicola* occur on the shore. From Dog's Bay the party drove back to Clifden in the evening, passing many typical Connemara cottages and villages, with marsh and moor plants springing up in the middle of the miserable crops of oats and potatoes, which are often sown in scarcely drained moor. The extreme poverty of this part of the country made a deep impression on the American visitors.

On the morning of the 23rd the early train was taken to Galway where a good deal of time had to be spent on account of the delay in the departure of the steamer to Ballyvaghan, which was not reached till about 4 p.m. The party were met on the quay by cars and drove at once in the direction of Black Head. Owing to the

lateness of the hour the cars were stopped about halfway and the party climbed the hillside and examined the vegetation of the limestone slopes, terraces and pavements, till the fall of dusk made it impossible to continue. One centre of interest was the occurrence of heath plants on the limestone. *Calluna vulgaris*, for instance, grows vigorously, with living functional roots pressed against the surface of the limestone rock. The ling does not, however, grow alone in this position, but always in the midst of great clumps of mosses, in the humus formed by which its seedlings have probably germinated. There is a very extensive heath flora, which specially interested Professor Graebner, on these limestone terraces. The other point of interest was the vegetation of the limestone pavements and particularly of the great chemically eroded fissures which abound in them. Here many species of trees and shrubs grow luxuriantly, but very seldom project above the surface of the pavement. It was generally agreed that this Burren country, with its almost untouched vegetation presenting an abundance of problems, deserves very thorough ecological study, which could only be carried out by carefully planned co-operative work with a properly equipped field station. When dusk fell the party returned to the road and drove back to Ballyvaghan in a nearly saturated atmosphere which foretold a change in the weather. Heavy rain, the first (except for a few drops at Blakeney) that had been experienced during the tour, fell during the night, and for the remainder of the time spent in Ireland the weather was unsettled and wet.

On the morning of August 24th some of the party visited before breakfast a fine area of *Potentilla fruticosa*, which is locally abundant in this region. After breakfast cars were taken for the drive to Ardrahan, entirely through the limestone country, with its regularly terraced hills and intervening stretches of plain. One of the most remarkable features of this highly glaciated region is the great scarcity of drift: where drift does occur it is at once recognisable by its different contours and the different vegetation which it bears. A short stop was made on the way to look at another piece of limestone pavement, but heavy rain drove the party back to the cars. After lunch at Ardrahan the train was taken for Limerick, Mallow and Killarney, which was reached late in the evening.

On August 25th the party drove to the Upper Lake, where the morning was spent in the woods on the Old Red Sandstone dominated by *Quercus sessiliflora*, with *Ilex Aquifolium* specially abundant, and yew, birch, mountain ash and *Salix cinerea*. Besides the ground flora characteristic of *Quercus sessiliflora* woods, *Saxifraga umbrosa* and *Euphorbia hibernica* were conspicuous and abundant, and *Melampyrum pratense* var. *hians* with its bright golden flowers and distinctly open palate was a beautiful feature. But the most interesting plant of all was, of course, *Arbutus Unedo*, which in spite of much destruction in past times is still abundant and locally dominant in these woods. The great luxuriance of all the plants, the abundance of bryophytes and of plants growing epiphytically on the trees, especially *Polypodium vulgare* and *Saxifraga umbrosa*, were a distinctive feature of the vegetation. *Pinguicula grandiflora* was gathered near the present upper limit of the woods, but *Saxifraga Geum* was not seen nor was the "Killarney Fern" (*Trichomanes*

radicans) which is now excessively rare. The weather was close, warm and "muggy" with an overcast sky and occasional drizzling rain, as if to give the visitors a correct impression of the climate determining the typical south-western vegetation. The Lower Lake was reached by boats on the return and a list was made of the plants on a wooded limestone island; from the dominance of ash, the much greater variety of shrubs, some of which are characteristic limestone species and the absence of *Calluna*, etc., it was clear that the difference of soil has its usual effect in this region in spite of the very strongly marked climate.

On August 26th the party travelled to Cork and visited the garden of Mr. Beamish at Ashbourne, near Queenstown Junction. In spite of the nearly continuous rain the members of the party, under the delightful guidance of their enthusiastic host, were keenly interested in the immense variety of plants which Mr. Beamish has got together in an incredibly short time. The rock garden, originally made in an old quarry, is specially rich and beautiful. Mr. and Mrs. Beamish afterwards hospitably entertained the party to lunch, and an unwilling departure was made in the afternoon in order to catch the steamer from Cork for Plymouth.

August 27th. The rugged cliffs of the Land's End, shrouded in mist, were sighted early in the morning after a fair passage, and most of the day was occupied in skirting the Cornish coast, Plymouth being reached about 4 p.m., in grey misty weather. The laboratory of the Marine Biological Association was visited by a few of the party, who were kindly shown round by the Director, Dr. Allen.

On the following morning, August 28th, Plymouth was left by an early train for Cornwall. At Truro most of the luggage was left and the party was joined by Mr. Hamilton Davey, the author of the *Flora of Cornwall*, who kindly accompanied the party during its stay in the county. After changing at Gwinear Road, Helston was reached and a special motor-omnibus taken to Lizard Town. By the roadside *Erica vagans* was soon seen in full flower and on the heaths of the Goonhilly Downs great sheets of it were passed. At Lizard Town the party were met by Mr. P. D. Williams of Lanarth. After lunch the party walked to Kynance Cove across the Lizard Downs, finding a number of characteristic species and the dwarf forms of several others, which are typical of the grassland of these cliffs. Beyond Kynance a wide circle was made over the heathland and some interesting observations were made on the ecological relations of these heaths, a thorough study of which would certainly lead to interesting results. The conclusion was reached that burning certainly has an effect of leading importance, for on a recently burned area all the species which are commonly found were at once returning, mainly by shooting from persistent underground organs, and the power to return quickly and occupy the soil must thus have a determining influence on the actually existing vegetation.

On August 29th most of the party drove *via* Mullion, where half-an-hour was spent on the cliffs, to Penrose by kind permission of the owner, and the vegetation of Loo Bar was briefly investigated. Meanwhile two or three of the members visited Mr. Williams' garden at Lanarth and also a hybrid of *Erica vagans* and *E. cinerea* recently discovered by him. Lunch was then taken at Helston, and

the party travelled to Truro. From Truro a local train was taken, and this was stopped by the kindness of the Great Western Railway Company on the line near Perranwell, so that the party could get as rapidly as possible to one of the best localities for *Erica ciliaris*. This plant was in splendid flower on a damp heath near the railway in conjunction with *Ulex Gallii*, *Erica Tetralix*, *Molinia caerulea*, etc. The hybrid *Erica ciliaris* × *Tetralix* was very frequent, associated with the parent species. This area has been recently encroached upon by arable land and is one of those which could be usefully preserved in perpetuity, not only as the habitat of a rare species, but as an example of an association which might easily come to be altogether destroyed. After returning to Truro the party were most hospitably entertained to dinner by members of the Royal Institution of Cornwall, the Bishop of St. Germans presiding. A great deal of trouble was devoted to organising this dinner, especially by Mr. George Penrose, the Secretary of the Royal Institution and Curator of the Truro Museum.

On August 30th the party travelled from Truro to Portsmouth and the peripatetic part of the expedition came to an end. During the week of the meeting of the British Association, however, the members of the party remained together, arrangements having been generously made by the local hospitality committee for their accommodation at two of the hostels belonging to the Women's Training College, and here, as guests of the Mayor, they were most excellently entertained by Miss White the Lady Superintendent and Miss Fawkes the Matron, while Mr. Delahunt the Local Secretary of Section K, was most assiduous in his efforts to provide the visitors with every facility that could be desired. To all concerned in this admirable example of organised hospitality the warmest thanks of all the members of the party are due.

The excursions of Section K, rather more numerous than usual, had been chosen with a view to the needs of the international party, and in addition to these one or two others were arranged apart from the Section. Portsmouth proved an excellent centre for illustrating the vegetation of the south of England, as opposed to that of the north and west of the British Isles, through which the route of the excursion mainly lay.

On the afternoon of Friday, September 1st the party travelled to Chichester and drove to Kingley Vale, five miles to the northwest, where in a dry valley of the chalk there is probably the finest example of a nearly pure yew-wood in the British Isles. Some of the continental visitors, indeed, were of opinion that it is probably the finest example in Europe. On the top of the down above, an excellent example of a heath on clay-with-flints overlying the chalk, with *Ulex nanus*, a characteristic species of the heaths of the central part of southern England, was visited.

Saturday, September 2nd was devoted to an excursion of Section K to Denny Bog and the adjacent parts of the New Forest. The zoned vegetation of the bog, and the adjacent woodland of oak and beech, proved very interesting and many good plants were gathered. The heathland between Beaulieu Road and Lyndhurst Road, on which the Scots pine, said to have been first introduced to the district in 1776, is rapidly spreading, was also traversed,

On Sunday some members of the party visited the salt marshes on the north side of Hayling Island, where Dr. Moss demonstrated various species of *Salicornia*. *Spartina Townsendi* covers large areas of these marshes and *S. stricta* was also found.

In the afternoon of Tuesday, September 5th, an excursion to Southampton Water, under the guidance of Dr. Otto Stapf, who has specially studied these *Spartinae*, was made in a steam-launch. Near Warsash, on the Hamble Creek, *Spartina Townsendi*, the supposed hybrid between *S. stricta* and *S. alterniflora*, covers the salt marsh, as it does on nearly all the shores of the Water. A local patch of *S. alterniflora* was also found, but no *S. stricta*. The launch then proceeded up Southampton Water close to the west bank as far as Hythe pier and obtained a good view of the vast stretches of *S. Townsendi* which have covered the mud flats of that shore within recent years. On the return journey the party landed at the point of the Calthrop Castle shingle spit and spent a short time examining the vegetation of this bank, which protects the *Spartina*-marsh behind it.

On Wednesday, September 6th, the last expedition of the tour was made. This was to the chalk downs near Butser Hill and to the woods of Ditcham Park, by invitation of Mr. Cave. The train was taken to Rowland's Castle station on the direct Portsmouth line of the South Western Railway. Here the party were met by Mr. Cave with four motor-cars, and were driven to the "Coach and Horses" on the London road where it rises to cross the chalk downs close to Butser Hill. The dry chalk valleys contain a well developed scrub of many different species of shrubs. The chalk grassland is nibbled exceedingly close by rabbits, which swarm on these downs, and but few plants, of which *Senecio Jacobaea* is the most conspicuous, propagate themselves by seed under these conditions. Ground vegetation is practically non-existent in the fragments of beechwood which remain (e.g., on Holt Down) but the thicker ashwoods and copses are, for some reason, less afflicted by the scourge and have quite an abundant and varied flora. The party crossed Holt Down and passed through woods of mixed beech and ash, with oaks conspicuously absent except where the rain-wash had provided a deeper soil towards the bottom of the valley. On the opposite slope, within the boundary of Ditcham Park, fairly typical oak-hazel copse, developed on a deep relatively non-calcareous soil overlying the chalk was met with. From this point the cars were taken to Ditcham House where Mr. and Mrs. Cave entertained the party to lunch. In the afternoon the typical beechwoods of the chalk escarpment facing the Weald were visited. Here the ground vegetation is much less affected by rabbits, though it is probable that their influence is still felt and may have something to do with the absence of free regeneration of the woods from seed. Afterwards a slope of down crowned by a mixed wood of beech, ash and yew was visited. Here two plots of ground on the edge of the wood and grassland had been enclosed two-and-a-half years ago with rabbit-proof wire fencing, and the effect on the herbage of the down was extremely marked. The protected down grassland was said by the American visitors to resemble closely some types of prairie. The enclosures were made largely with the object of determining if the ravages of the rabbits alone prevented the regeneration of the

wood, but no positive results are as yet forthcoming on this point. After tea at Ditcham House the party were driven back to Rowland's Castle and took train to Portsmouth. This excellent and extremely pleasant excursion, which was made possible through the kindness of Mr. and Mrs. Cave, formed a brilliant wind-up to the expedition : on the next day there was a general dispersal of the members of the party.

So far as the carrying out of the programme was concerned, the whole excursion worked very smoothly, thanks mainly to careful organisation beforehand. The people responsible for the different sections of the tour made all the local arrangements for hotels, driving, etc. The General Manager of the Midland Railway made the railway arrangements, the necessary accommodation being in most cases reserved for the party by the different companies. In Ireland there was a reserved double saloon on the Midland and Great Western, and a reserved coach on the Great Southern and Western, while the London and South Western Railway provided a through coach from Exeter to Portsmouth. The party had very great luck in being away from the centres affected by the railway strike during the continuance of the strike. The only hitch that occurred was the loss of some luggage for about a fortnight. It was eventually found and restored to the owners, though with some damage.

The weather was hot and dry throughout, except during three days in Ireland. The health of the party was excellent, scarcely a single member being indisposed during the whole five weeks. In spite of the strenuous nature of the tour everyone was perfectly fit and well at its close, and ready to begin all over again. A more amiable and harmonious party, a set of people easier to deal with, more anxious to be pleased and to make the best of everything, can hardly be imagined. There was absolutely no friction of any kind whatever, and many old friendships have been strengthened and new ones formed.

With regard to the scientific results, floristically the tour was a decided success. The long companionship in the field of continental and British field botanists could not avoid giving to both clearer ideas of critical species, and incidentally several species and varieties new to Britain were discovered. For details Mr. Druce's paper in the next issue of this journal should be consulted. In regard to the conceptions of units of vegetation, opportunities such as these

of meeting in the field workers from different countries are, in the opinion of the present writer, absolutely essential to progress in the present position of the subject. The fruits of this particular expedition will become apparent in the future, while the stimulus afforded to the British workers both by the kindly appreciation and by the keen criticism of the visitors, will certainly be very marked.

The organisation of the present excursion has led to a determination on the part of the foreign visitors to organise similar expeditions in their own countries. Professors Clements and Cowles have decided to arrange an international excursion in the States in August and September, 1913; and Professor Schröter, Professor Massart and Dr. Ostenfeld have in view international excursions in Switzerland, Belgium and Denmark in 1915, the year of the International Congress in London, when the American botanists expect to be again in Europe. There was also talk of an International Phytogeographical Society. Such a society, if it were given a suitable organisation, would be of the greatest service in advancing the subject, which is nearly ripe for an effort of this kind.

A. G. TANSLEY.

III.—THE FLORISTIC RESULTS.

THE first International Phytogeographical Excursion through the British Isles in August last, which had been so admirably planned by Mr. A. G. Tansley, with the help of his colleagues of the British Vegetation Committee, who acted as genial and accomplished guides, and often dispensed a gracious hospitality, proved a great success, since the visitors included not only distinguished ecological authorities like Professors Drude, Schroeter, Cowles and Clements, and expert botanical photographers like Professor Massart; but also such critical field botanists as Professor Lindman and Dr. Ostenfeld, and erudite botanical systematists like Professor Graebner. Therefore the writer, who had the privilege of accompanying the party throughout the extensive and wisely selected route through the British Islands, has to express his gratitude for the unique opportunity afforded of getting in touch with the views of his Continental *confrères*, and to offer his thanks to all the members of the party, and to the various leaders for their unvarying kindness. May he take this opportunity of saying that he feels, as a floristic botanist, that in future he must not be content with merely looking at or studying the individual, but must also investigate its neighbours and environment? So also he ventures to suggest that phytogeographers must not be satisfied with knowing "big" species only, but also be able to discriminate the more critical forms, since these are often special adaptations, and may prove the key to more than one vexed problem.

The following notes on some of the rarer, or more specially interesting plants observed on the journey may not, it is trusted, be considered out of place in these pages. It will be observed that through the acumen of Dr. Ostenfeld, a new waterlily and a Lady's Mantle have been added to our flora, that Professor Massart pointed out a new "variety" of *Sagina nodosa* and that Dr. Graebner urged that *Juncus ranarius* has claims to specific rank. Professor Graebner also showed the members a variety *Erikæ* of *Calluna vulgaris*, which Professor Ascherson had named after Professor Graebner's wife, Frau Erika Graebner, while Dr.

Lindman directed attention to a hitherto undescribed form of *Polygonum aviculare*, and Dr. Moss demonstrated the characters of several species of *Salicornia* and *Quercus*, which are described in his excellent papers on those genera.

It may be added that the writer has purposely left almost unnoticed the Brambles and Roses, and has left unmentioned not only many of the planted trees observed, but numerous other forms which still require elucidation.

The names of plants presumably new in name to Britain are printed in heavy type. A dagger (!) before a locality or county means that it is an addition to the records in Watson's *Topographical Botany* and Mr. Arthur Bennett's *Supplement* thereto. An asterisk (*) before a name means that the plant is alien to the British Flora, before a locality that the plant is presumably alien to that locality. The sign \times means a hybrid. The numbers after a locality refer to comital numbers of *Top. Bot.* and *Irish Top. Bot.* The sequence and nomenclature is that of the writer's *List of British Plants*, which by the kindness of the Delegates of the Clarendon Press was supplied to all the foreign members of the party.

4. *Thalictrum minus* L., in one of its numerous forms was observed on an island in the Lower Lake, Killarney 2.

T. collinum Wallr. is recorded for Killarney in the *Cybele Hibernica*.

20. *Ranunculus acris* L. On Ben Lawers 88, the plant which Herr Freyn of Prag names for the writer *R. Nathorstii* Berl. was observed at high elevations. The variety *Boreanus* (Jord.) occurred at Roundstone, Galway 16.

22. *R. bulbosus* L. occurred in flower as a form with deeply cut leaves (perhaps *brachiatus* Schleich.) on the limestone rocks, near Ballyvaghan, Co. Clare 9.

24. *R. Flammula* L. as the sub-species or species 26. *R. Scoticus* Marshall was noticed in loughs about Craiggia More, but it may be that this form is not quite identical with the Scottish specimens. Dr. Glück is going to test its permanence of in cultivation.

48. *Caltha palustris* L.: a form of this with smaller but contiguous sepals occurred on the margins of one or two of the Norfolk Broads, flowering in August.

49. *C. radicans* Forster, near Butterston Loch,† Perth 7 E. 89.

77 bis. ***Castalia candida* (Presl.) Schinz & Thellung (*Nymphaea candida* Presl. Delic. Prag. 224),** was pointed out by Dr. Ostenfeld in a loch in the Dunkeld policies, † East Perth 89. In this locality it was in company with introduced species, and might possibly have been introduced with them. But its occurrence in undoubtedly

native localities in Ireland makes it probably of widespread occurrence in Western and Northern Britain. The plant is closely allied to *C. alba* Wood, the common white waterlily, and in some parts of Germany where they are frequent, the two forms are sometimes with difficulty separated. The distinguishing characters are the absence of stamens from the upper part of the ovary, leaving the neck bare; the pollen grains are smooth (not tuberculate as in *alba*), and somewhat larger. The lowest pair of leaf-veins are curved, and if produced would cross, inclosing an oval area.

The plant occurs in Finland, Sweden, Poland, Germany, Switzerland, Austria, Bohemia, Hungary, Tyrol, Siberia, Kashmir, etc., and, attention having been directed to it, will probably be found to the more frequent form in Scotland.

At †Craigga More 16, Co. Galway, Dr. Ostenfeld found it in a small Lough west of the road, and independently the writer found another on the east side, and also at †Roundstone, Co. Galway 16.

126. *Radicula palustris* × *sylvestris*. A plant which possibly has the above parentage, but in facies is very much nearer *sylvestris*, was noticed many years ago by the writer at Perth, on the west-side of the Tay 89. On this visit it was also noticed on the east-side of the river in some quantity. The plant is sterile and the petals scarcely open.

128. **Barbarea verna* Aschers., Perth 89.

133. *Arabis hirsuta* Scop., Silverdale, Lancashire 69.

161. *Draba incana* L. Monsal Dale, Derby 57, Ben Lawers 88, frequent. [A sure index to calcareous soils, occurring in shell-sand at the sea level in East Ross 106].

185. **Sisymbrium orientale* L. †Clifden, on the railway (Schroeter) and on the shores of Galway Bay.

217. **Brassica alba* Koch., on the shores of Galway Bay.

207. **Diplotaxis muralis* DC. †Clifden, on the railway, Galway 16, and also at Queenstown Junction; a distinct follower of the iron-road and thus gaining extension of its area year by year. The bare ballast, with few competitors, is its favourite home.

232. *Bursa pastoris* [= *Capsella Bursa-pastoris*] Weber var. *cuneata* Druce. Millers Dale, Derby 57. Honley, Yorks. 63. Southport, Lancashire 59. Penrith, Cumberland 70.

239. **Lepidium perfoliatum* L. Alien, Galway Bay.

293. *Viola sylvestris* Kit. On the limestone rock, near Ballyvaghan, † Co. Clare 9. A specimen of the above species was found in flower in this locality on August 23rd.

294. *Viola Riviniana* Reichb. A luxuriant cleistogamous form, forma *villosa* (N.W.M.) of this plant (teste E. S. Gregory) was noticed at Killarney.

Var *diversa* E. S. Gregory, Rep. Bot. Exch. Club, 496, 1910, at †Ballyvaghan, Co. Clare.

296. *V. canina* L. On Ben Lawers (Mid-Perth 88), at an altitude of 2,500 to 3,000 feet, this plant occurred as a large cleistogamous form, which suggested to Professor Graebner, but since his return to Berlin he refers it to *canina*, a conclusion also arrived at by Mrs. Gregory and the writer.

301 bis. *Viola epipsila* Ledebour. [This plant, which was recorded in the Report of the Exchange Club for 1910, p. 497, as

having been noticed in a sheet of *Viola palustris* from Hamilton Tor, S. Devon, collected by Mr. W. F. Miller of Winscombe. In June, 1911, the writer was fortunate enough to find the plant in some plenty in several places near Moreton Hampstead and Widdycombe. Although essentially lowland, and a nature of alder swamps and shady places, it also occurred in some bare elevated places on Hamilton Tor. The appearance of the plant at once reminded the writer of a plant he had seen at Burghfield, Berks, about 1890, and on his return he visited that locality where he found *V. epipsila* in some quantity and in a similar situation. But similar localities in Bucks only yielded *V. palustris*.] At Killarney, near the upper lake, the writer again met with this form, thus adding a new plant to †Ireland, Kerry 2. The hairy petioles and the hairy nerves on the under leaf surface, together with a slightly more pointed end to the leaf are distinguishing features, but the plant is very closely allied to *V. palustris*, from which, however, Becker in his recent monograph keeps it distinct. In Europe it appears chiefly as a northern plant, so that its occurrence in Devon and Kerry was somewhat unexpected, especially as the apparently suitable home among sphagnum and alder, at Dunkeld only afforded *V. palustris*. Mrs. Gregory assents to the name.

333 bis. **Saponaria orientalis* L. An Eastern alien. Occurred by †Galway Bay 16 with other casuals.

334 b. *Silene amoena* L. (=*S. maritima*) var. *parvifolia* (Druce). This small-leaved Sea Campion which the writer found on the shingle of Looe Bar, Cornwall, was also found this year (F. Hamilton Davey). Its correct name, however, is *S. maritima* With. var. *parvifolia* Druce, as given in the *List of British Plants*, since *S. amoena* L. Sp. Pl. 1753, from Siberia, is almost certainly a distinct species. Another form of *S. maritima*, which is worth further study, occurred close to Ross Castle, Killarney. The type occurred in plenty on the shingle beach at Blakeney, Norfolk, W. 28.

368. *Cerastium alpinum* × *vulgatum* = × *C. Symei* Druce in Bot. Exch. Club Report 498, 1910. Ben Lawers 88 with both parents, agreed to by Dr. Ostenfeld.

370. *C. vulgatum* L. var. *longirostre* (Wichura). Ben Lawers 88. var. *hirsuta* Fries. †Foulshaw, N. Lancashire 69.

374. *C. tetrandrum* Curtis. Blakeney, Norfolk, W. 28. Roundstone, Galway 16.

382. *Stellaria Dilleniana* Moench. Near Sutton Broad in two stations. Growing with *S. Dilleniana* var. *palustris* (Retz.) (=*S. glauca*), and flowering at the same time; thus supporting the writer's contention (*Bot. Exch. Club Report*, 546, 1910), that the two plants are not specifically distinct. Professors Graebner and Lindman both know the plant well, and are of the same opinion. In some parts of Sweden, this green plant is much commoner than the glaucous variety.

383. *Stellaria graminea* L. var. *latifolia* (Godron) Rouy and Fouc. iii, 234, 1896. Under this would come robust, large-leaved plants which grow near Dunkeld, E. Perth 88, and near Perranwell, Cornwall 1.

399. *Sagina nodosa* Fenzl. var. *glandulosa* (Besser Prim. Fl. Galile, ii, 359, 1809) = *S. nodosa* var. *pubescens*, Mert. & Koch, Deutsch Fl. iii, 362, 1831. †Galway 16, sometimes as a very luxuriant tufted plant.

†Var. *simplex* Graebn. N. G. Danzic, N. F. 1. 362, 1896, with the type (*e. glandulosa*) on the Southport dunes 59.

Var. **moniliformis** (Meyer Chlor. Hann., p. 206, 1836, under *Alsine nodosa*) Lange. Meyer's (l.c.) brief description is "Kurz-blätterige, Blätter knorrig Miene." Professor Graebner agreed to this determination, and Professor Massart pointed out the latter plant to the party growing in "slack" on the Southport dunes, where it was abundant. [Mr. W. G. Travis shows (*Journ. Bot.* 270, 1911), that this variety affords an interesting instance of vegetative reproduction.]

407. *Sagina maritima* Don. On the shingle at Blakeney, Norfolk, W.

403 bis. ***Sagina glabra*** Fenzl. Verbr. Alsin. t. ad., p. 57. 1833. *S. repens* Burnat in Greml. Fl. Schweiz, ed. 3, 100. *Spergula glabra* Willd., Sp. Pl. ii, 821, 1799. *S. saginoides* All. Fl. Ped. t. 64, 1785. *S. repens* Zumgl. Fl. Ped. ii, 286, 1864. *Spergella glabra* Reichb. Ic. Fl. Germ. et Helv. t. ccii. f. 4964. This plant was noticed by the writer on the lower slopes of Ben Lawers 88, by the large burn which descends from the Gentian rocks, and was, at first, a complete puzzle. It suggested a large-flowered *S. saginoides*, or a creeping form of *S. subulata*, or perhaps a pentamerous petaloid *S. procumbens*, but as fresh plants were found, one after another of these suggestions was dismissed as untenable. The plants were in considerable quantity and in free flower on this hot sunny day, at a much later date (August 17th) than the writer had ever been on the hill. Dr. Ostenfeld became inclined to refer them to a hybrid of *procumbens* and *saginoides*, but the plants were fertile and commoner than either of the assumed parents. Professor Graebner agreed with the writer in assigning them to a distinct species. The plants occurred on an altitudinal range of from 1,200 to 3,500 feet. Subsequent comparison leads the writer to refer them to the above species, which occur in "prairies sablonneuse" in the Alps of Switzerland, France, Italy and the Tyrol. The chief difference appears to be that in the Scottish plant the capsule is somewhat smaller. From *S. saginoides* it may be known by its large flowers, though doubtless in herbaria it will be often found to represent that species. From *S. subulata* its more creeping habit and more woody root stock will distinguish it. Owing to the difference in the capsule it may be worth while distinguishing the Scottish form from the Continental species as var. *scotica*.

402. *S. nivalis* Fries. In some plenty this year on Ben Lawers and with it plants which Dr. Ostenfeld considered to be *nivalis* × *saginoides*.

403. *S. saginoides* Dalla Torre. On Ben Lawers up to 3,800 feet, but over flower. (*S. glabra* was in full blossom).

411. *Spergularia rupestris* Lebel. Plentiful at the Lizard 1.

421. *Montia fontana* L. (*M. lamprosperma* Cham.) Chewbrook Clough† 63, Ben Lawers 88, Killarney, †Kerry 2.

421 bis. *M. verna* Neck. †Near Dunkeld 89, practically new to Scotland, but specimens from Fife 85 are in *Herb. Edin.* Perranwell, Cornwall 1.

424. *Elatine hexandra* DC. Looe Pool 1.

479 bis. *Geranium Endressii* Gay in Ann. Sci. Nat. Sér. i. t. xxvi, 228, 1832. This ornamental alien species from the West of

Europe occurred in the woods of Woodsome Hall, Yorkshire 63, where it was doubtless introduced.

488. *G. Robertianum* L. var. *purpureum* Forster. †Galway Bay 16.

†Var *Villarsianum* Jord. Ballyvaghan, Co. Clare 9.

497. *Erodium cicutarium* L'Hérit. var. *glandulosum* Bosch. on the sand dunes at Southport 59; Roundstone, Galway 16.

500. **Tropaeolum peregrinum* L. Alien †Galway Bay 16.

513. **Impatiens glandulifera* Royle and its var. *pallida*. Mallow, Ireland 5.

519. *Rhamnus catharticus* L. †var. *Schroeteri*. This plant which was conspicuously different from the type by its more yellowish-green foliage and by the leaves being covered with a mealy pubescence was first noticed by Professor Schroeter by the roadside in Silverdale 69. It was in good fruit.

528. **Lupinus nootkatensis* Donn. On the shingly margins of the Tay near Aberfeldy 88.

538. *Ulex Gallii* Planchon was in good flower by the roadside above Honley, York 63, at the foot of Crossfell near Kirkland, and was in magnificent show at Roundstone and on the hillsides by Galway Bay (with var. *humilis* Planch.) 16 and also at the Lizard I, etc.

539. *Ulex minor* Roth (=*U. nanus* Forster) characteristic on the heath on Bow Hill, north-west of Chichester, and on the New Forest heaths.

597. **Melilotus indica* All. Alien on the shores of Galway Bay †16.

599. *Trifolium pratense* L. var. *americanum* Harz. †Near Dunkeld 89.

683. **Vicia varia* Host. This beautiful European vetch also occurred as an alien at †Galway Bay 16.

746. *Spiraea Ulmaria* L. var. *denudata* Boenn. Woodbastwick, etc., Norfolk 27. This variety keeps true not only in cultivation but from seed. The result of Professor Yapp's experiments are awaited with interest.

879. *Rubus saxatilis* L. Monsal Dale 57.

880. *R. Chamaemorus* L. A most striking feature in the vegetation of the upper part of Blackchew Head Moors 63, but mostly barren.

881. *Dryas octopetala* L. In the greatest abundance near Ballyvaghan 9, and still in flower August 23rd.

888. *Potentilla fruticosa* L. The abundance of this local species proved a great joy to the foreign members when they saw it in one of the turloughs near Ballyvaghan 9, and repaid them for their early rising.

890. *Potentilla Anserina* L. On the bare sand of Roundstone Bay 16 this plant appeared in an interesting modification, the runners spreading over a circuit of 4 feet. The plant was the var. *discolor* Wallr.: upper surface of leaves green and glabrous, the under surface densely covered with silvery pubescence.

900. *P. verna* L. Silverdale 69.

902. *P. procumbens* Sibth. Greenfield 63, Silverdale 69, Lizard and Truro 1, Roundstone, Galway 16, Killarney 2.

902. *P. procumbens* × *reptans* = *P. mixta* Nolte. To this hybrid

may probably be referred a pretty plant which grew on the bank of the road near Truro, where Mr. F. Hamilton Davey found it in some plenty.

903. *P. erecta* × *procumbens* Sibth. A plant with distinctly petiolate leaves which is probably this hybrid occurred on the †Lizard Downs 1.

909. *Alchemilla vulgaris* L. var. **acutidens** (Buser) Briquet in Burn. F. Alp. Marit iii, 149, 1899. = *Alchemilla acutidens* (Buser) Bull. Herb. Boiss. ii, 104, 1894. Lindberg Die nord Alchemella vulgaris-Formen, p. 111, t. 16, 1909). Pointed out by Dr. Ostenfeld on a rock in the Carie Burn running from the west side of Ben Lawers at about 1,200 feet, and in many places up to 3,500 feet on Ben Lawers, and on rocks above Lochan 'a Chat 88.

It is found in Iceland, Faroes (Ostenfeld), Norway, Sweden, Finland and Russia, and thus was likely to be found in Scotland. The writer is at present unable to find any strong distinguishing features by which to separate it from the var. *glabra* DC. (= *A. alpestris* Schmidt).

909. *Alchemilla vulgaris* L. var. *minor* Huds. (= *A. filicaulis* Buser *vestita*). Greenfield, Yorks 63, Silverdale 69, Ballyvaghan, Co. Clare 9.

914. *Agrimonia odorata* Miller. Roundstone, Galway, 16.

945. × *Rosa involuta* Sm. In one of its protean forms this hybrid was seen in Monsal Dale 57, for which place *R. Doniana* and *R. Robertsonii* are recorded in *Flora Derby*, 135, 1903.

957. *Pyrus Aucuparia* Ehrh. var. (or forma) **flava**. The Mountain Ash with orange-yellow fruits was shewn to us by Dr. Ostenfeld at Roundstone, Galway 16, and it also occurred at Killarney 2.

959. *P. intermedia* Ehrh. As a planted tree at *Greenfield, Yorks 63, and passed as this species by Professor Graebner.

961. *P. Aria* Ehrh. var. *rupicola* Syme on the limestone rock, at Silverdale 69.

966. *Crataegus Oxyacantha* L. (= *C. monogyna* Jacq.) var. *cuneata* Druce. †Clifden, Co. Galway 16.

972. **Cotoneaster microphylla* Wallich. Was seen naturalised in several places and *C. Simonsii* Baker *near Clifden, Galway 16.

978. *Saxifraga rosacea* Moench (*decipiens* Ehrh.) Ben Lawers, attested by Professor Graebner.

996. *Chrysosplenium alternifolium* L. At 3,000 feet and upwards on Ben Lawers.

999. **Escallonia macrantha* Wedd. Naturalised, †near Clifden, Galway 16.

1000. *Parnassia palustris* L., as a dwarf plant with very large flowers and fruit at Southport 59, in the damp "slacks" of the sand dunes.

1010. *Sedum Telephium* L. var. *Fabaria* Koch (? *purpureum* L.) in Silverdale 69, and by the Tay, Perth 89. There appears to be some doubt in the minds of our foreign confrères as to whether we have the true *S. Telephium* L. in Britain. All the plants seen were referred by them to the above form.

1015. *S. acre* L. Professor Schroeter and Professor Graebner considered that the *S. acre* as seen by them in Norfolk 28, Miller's Dale 57, Southport 59, Westmoreland 69, and Cumberland 70 was

not the German or Swiss plant. Professor Graebner is going test it in cultivation.

1033. *Myriophyllum alterniflorum* DC. Common in Butterston Loch, etc., Dunkeld, E. Perth 89. Also in streams and loughs near Roundstone 16, and Killarney 2: in these localities the plant was often very dwarfed and the leaves very short.

1040. *Callitricha autumnalis* L. Butterston Loch, E. Perth 89.

1042. *Pepis Portula* L. At Killarney 2, a form of this plant was found in which the calyx-teeth were long—thus approaching the var. *longidentata*, J. Gay and the writer proposes to distinguish this plant as var. **dentata** to distinguish it from the common plant of Eastern Britain in which the calyx teeth are short or obsolete. The Atlantic and Mediterranean plant is usually var. *longidentata*.

1047. *Epilobium hirsutum* L. with wholly female flowers in Silverdale 69.

1051. *E. obscurum* × *parviflorum* †Clifden, Co. Galway 16.

1052. **E. roseum* Schreber. As a garden weed in Lancaster 60, Greenfield 63 and by the Tay at Perth †89.

1056. *E. alpinum* L. Huds. Crossfell at about 2,600 feet 70.

1064. **Œnothera Lamarkiana* Ser. in several mutations near Southport 59.

1071. **Fuchsia Riccartoni* Hort. In magnificent flower and quite naturalised near Clifden and Roundstone, Galway. No specimens in fruit were found. Does it produce seed?

1073. *Circaeæ intermedia* Ehrh. By the Tay at Perth 89, also by Loch Tay 88, perhaps rather a distinct species than a variety, and possibly originally a hybrid of the two other species which has become "fixed."

1077. **Mesembryanthemum* sp. Abundantly naturalised near Penrose, Cornwall. The specific identity is apparently somewhat doubtful. In Davey's excellent *Flora of Cornwall* it is referred to as *M. aequilaterale*, Haworth, but the name *M. acinaciforme* L. was suggested by some of the foreign visitors.

1100. *Cicuta virosa* L. In great plenty and in beautiful colouring in the Norfolk Broads 27.

1118. *Chærophyllum aureum* L. was found in great quantity (in the original station, see Bot. Exch. Club) by the Teith at Callander 87 where the consensus of opinion was in favour of its being native there. It was "one of Don's reputed discoveries"!

1133. *Œnanthe fluviatilis* Colem. was seen in abundance near Cambridge, etc. This plant, long considered to be endemic, has been found plentifully in Germany and Luxembourg by Professor Glück.

1153. *Heracleum Sphondylium* L. At 3,000 feet on Ben Lawers 88, as a glabrous plant=var. *glabrum* Koch.

1172. *Hedera Helix* L. The plant of Silverdale had much narrower leaves on the flowering shoots than the midland plants, but not quite so extreme as in the Skye Ivy.

1175. **Cornus stolonifera* Michx. By the Tay 89.

1196. *Galium sylvestre* Poll. Monsal Dale 57, Ben Lawers 88.

1198. *Galium Witheringii* Sm. Sutton Broad †27. Perhaps a distinct species.

1214. *Sherardia arvensis* L. var. *maritima* Griseb.=*(Asperula Sherardi* var. *maritima*). Roundstone, Galway †16. A form with the calyx teeth nearly obsolete.

1240. *Eupatorium cannabinum* L. with undivided leaves at the Lizard 1, but probably not the *indivisa* DC.

1243. *Solidago Virgaurea* L. This variable plant was observed as var. *cambrica* (Huds.) on Ben Lawers, as a narrow-leaved plant (var. *angustifolia* Koch) at Killarney, and as a very stout dwarfed form with sub-capitiate inflorescence, with leaves varying considerably in width and the outer florets scarcely so large as in *cambrica* on the Lizard Downs. Comparative culture of these forms could not fail to give interesting results.

1258. *Aster Tripolium* L. with discoid capitula in many places, Hayling Island, S. Hants 11, North Bull, Co. Dublin 21.

1283. *Inula crithmoides* L. Hayling Island near Havant 11, fringing the salt marsh and in good flower.

1291. **Ambrosia artemisifolia* L. An alien doubtless introduced with chicken food at Havant, †S. Hants 11.

1297. **Rudbeckia laciniata* L. in plenty by the Tay at Perth 88, 89, where it has long been naturalised.

1298. *Achillea Ptarmica* L. in upland pastures near Greenfield, S.W. Yorks 63, as a smaller and more compact plant than usual.

1338. *Anthemis nobilis* L. Rather common about Clifden and Roundstone, Galway 16.

1360. *Matricaria inodora* L. var. *maritima* (L.) Culture in this case is much needed, as there are two or three maritime forms, which require investigation. Roundstone, Galway 16.

1362. **M. suaveolens* Buck. The rapid advance of this American species through Britain is most remarkable. It follows the roads and may owe its origin in many cases (as *Juncus tenuis* probably does) to American fodder or corn. It was noticed near Sutton Broad, †Norfolk, E. 27, Derby 57, Yorks, S.W. 63, Lancashire 59, Cumberland 70, †Westmoreland 69, and in Co. Galway, Dublin, and †Cork.

1376. *Artemisia maritima* L. Rather plentiful near Blakeney, and under two modifications, one much less hoary than the other and forming distinct patches on the salt marsh. It was still too early in the year (August 6th) to be certain whether these were the type and the var. *gallica* (Willd.) respectively. The latter has erect capitula. It was found in flower at Hayling Island on September 3rd.

1394. *Senecio Jacobaea* L. var. *discoideus* L. Plentiful near the coast at Roundstone, although plants of the well marked rayed form were in the vicinity. [The rayless form of the Ragwort was noticed by Sherard near Drogheda prior to 1724 when it is recorded by Dillenius in the *Synopsis*.]

1401. *Senecio vulgaris* L. forma *crepiformis*. Blakeney, Norfolk, W. 28, on the bare shingle. A curious form in which the capitula instead of being cylindric or nearly so as is usually the case, were extremely broad at the base like a *Crepis*. [An exactly similar form occurs at Pyrford, Surrey 17 where its curious looking capitula attracted the attention of Lady Davy who took the writer to see it. This character may be caused by a gall.]

1410. **Calendula officinalis* L. as an alien at Galway Bay †16.

1420. *Arctium nemorosum* Lejeune. Frequently seen on the excursion, as at Monsal Dale, Derby 57, Silverdale †69, near Kirkland †70, near Dunkeld †89, Roundstone, Clifden, Co. Galway †16,

1434. *Cirsium palustre* Scop. var. **ferox** mihl. Near Silverdale and near Carnforth 69, on the slopes of Crossfell 800-1400 feet, often white flowered, Cumberland 70, on the roadside near Dunkeld, E. Perth 89, and Lawers, near Perth 88.

A most strongly spinous plant with more condensed inflorescence than the type. The spines are pale coloured and the foliage of a paler green. The continental botanists agreed that it was quite a distinct form from typical *C. palustre* and suggested that it should be separated as a variety from the type. It may perhaps prove to be the Spanish plant var. *spinossissimum* Willkomm.

1638 var. K. *Hieracium umbellatum* L. var. **dunale** G. Meyer. Southport sand dunes 59 in great quantity and although varying in stature well marked by the abrupt transition from long to shorter leaves.

1644. *Leontodon nudicaule* Banks (*L. hirtum* L.) var. *lasiolena* Druce, Southport 59. At the Lizard the common plant was the var. *leiolena* Druce.

1646. *Taraxacum spectabile* Dahlst. var. *maculigerum* Dahlst., near Woodsome, York †63.

1656. *Sonchus arvensis* L. var. *angustifolius* Meyer, Blakeney 28.

1657 *S. oleraceus* L. var. *runcinatus* Coss. & Germ. Galway †16.

1666. *Jasione montana* L. var. *litoralis* Fr. Clifden, Galway 16.

1687. *Oxycoccus quadripetala* Gilibert (= *Vaccinium Oxycoccus*). In some quantity on Foulshaw Moss 69, passed by Professor Lindman as the typical plant; a smaller plant with narrower leaves of a slightly different outline which grew sparingly in Crowden Clough, Cheshire 58, Professor Lindman thought might possibly prove to be *Oxycoccus microcarpus* Turczaninov. At Foulshaw Moss 69, the Cranberry was associated with *Andromeda Polifolia* L.

1693. *Calluna vulgaris* Hull var. **Erikae** Ascherson and Graebner.

On the moors near Wessenden Head, Yorks, pointed out by Professor Graebner: near Honley, Yorks: also on Ben Lawers 88, but scarce at 2,800 feet; at Dunkeld, E. Perth 89: also on Urrisbeg near Roundstone, Co. Galway 16: at Killarney, Co. Kerry 2: and on the Lizard moors above Kynance, Cornwall 1.

A handsome white-flowered form is cultivated in the Edinburgh Botanic Garden.

This rooting prostrate plant with descending flowering branches, Professor Graebner says retains its character in cultivation at the Berlin Garden.

1694. *Erica cinerea* L. The inflorescence of the Galway plant is much longer and finer than that of the British plant; about Roundstone it was particularly handsome. At Key Downs 1 a form with very large flowers was seen.

1695. *E. Tetralix* L. On the Lizard Downs 1, a very small flowered form was noticed.

Erica Tetralix × vagans nov. hybr. Last year Mr. F. H. Davey, the very efficient leader of the party through Cornwall and the author of an excellent *Flora of Cornwall* (published J. of B. 333, 1910), the description of a new hybrid heath, which had been found by the eminent horticulturist, Mr. P. D. Williams, of Lanarth, on the downs near St. Keverne 1, as *E. vagans* × *cineraria*. On the

second visit Mr. P. D. Williams brought some fresh specimens which the writer considered showed evidence of *Tetralix* as a parent. As it was desirable to see the living plant (a solitary bush) in its native habitat, Mr. Williams kindly motored Professor Graeber, Professor Schroeter and the writer first to his beautiful grounds, where he has a plant in cultivation, next to the plant *in situ*. A careful examination of the plant and its surroundings induced all three botanists to agree that the hybrid must be *E. Tetralix* \times *vagans* and not *cinerea* \times *vagans*, since the presence of the glandular hairs must have come from the former species.

The longer stamens, the inflorescence and the habit, suggested the presence of *vagans*, both species being in the immediate vicinity.

Planta suffruticosa, ramosissima, 40 cm. alta. Floribus axilaribus vel interdum subterminalibus, in tense roseus, urceolatis, staminibus vagante similibus, sed inclusis, stylis prolongates.

Foliis linearibus, marginibus recurvatis, prope hispido-ciliatis; ovariis hirsutis. I have named it (*Gard. Chron.*, Dec. 2nd, 1911) \times *E. Williamsii* after its discoverer. It has been independently described in the *Kew Bulletin*, 1911, p. 378.

1696. *E. Mackayi* Hook. was in good flower at its classic locality, Craigga More, Co. Galway. The glabrous fruit appears to be a constant character.

1697. *E. ciliaris* L. Abundant on a damp heath near Perranwell.

E. ciliaris \times *Tetralix*=*E. Watsoni*, Benth. An obvious intermediate, almost certainly this hybrid, growing with both parents in the same locality.

1704. *Boretta cantabrica* O. Kuntze (=*Dabeocia polifolia*). The profusion of this beautiful species at Roundstone greatly rejoiced the foreign visitors, as did the extensive sheets of *Erica vagans* in Cornwall.

1707. *Pyrola rotundifolia* L. var. *arenaria* Koch was still in flower in small quantity at Southport, but building operations and the golf have sadly restricted its area and indeed threaten its existence.

1713. *Limonium vulgare* Miller in various forms and as var. *pyramidalis* Druce grew at Havant, Hants, S. 11: the hybrid with *L. humile* (*L. Neumannii* C. E. Salmon) also occurred.

1716. *Limonium reticulatum* Miller, *L. humile* Miller and *L. binervosum* C. E. Salmon were all found in good condition at Blakeney 28, the latter in two modifications.

1714. *L. humile* Miller was also seen at North Bull 21, Ireland, and at Havant, Hants, S. 11.

1722. *Statice maritima* Mill. (=*Armeria maritima*) at North Bull, Co. Dublin. The common plant on Ben Lawers was an alpine form of *S. linearifolia* Laterr., not as has been suggested (*Williams Alp. Fl. Brit.*) *S. alpina* Poiret. *S. linearifolia* was also the common coast plant at Blakeney, Norfolk, W. 28, Southport 59, Dublin, Roundstone, Galway, and the Lizard, Cornwall 1. [This latter plant differs in the spaces between the ribs of the fruit-calyx, being destitute of hairs, which are confined to the ribs only. In true *maritima* the hairs occur also between the ribs, a character which was used by their monographer Boissier to divide the Thrifts into Pleurostichous and Heterostichous groups. In Britain, however,

the characters are not very sharply defined. But experimental culture of these forms is sadly needed, and as the distribution of the Thrift is a very interesting one, the results of careful culture and investigation could hardly fail to be of great value.]

1733. *Lysimachia vulgaris* L. with more downy leaves than usual in the Norfolk Broads 27.

1749. *Ligustrum vulgare* L. var. or forma *prostrata*,† Lizard 1, Dr. Ostenfeld.

1765. *Gentiana campestris* L. as the type plant was seen on Lawers 88 and the var. *baltica* (Murbeck) at Southport 59.

1811. *Pneumaria maritima* Hill (*Mertensia*) was pointed out to the party by Professor Oliver on the shingle at Blakeney Point, in its most southern station in England 28.

1854. *Atropa Belladonna* L. In great quantity near Haweswater, Silverdale 69. Probably native.

1878. *Linaria repens* Miller. Plentiful by the railway near Riccarton Junction with *Senecio viscosus* L.† Roxburgh 80. A plant which, like its relation *L. minor*, is spreading along the railway systems.

1903. *Digitalis purpurea* L. As Professor Balfour pointed out that the plants of Ben Lawers are truly perennial, as is the case with those cultivated in the Edinburgh Botanical Garden.

1912. †*Veronica Anagallis* L. The true plant, which differs from the common British plant *V. aquatica* Bernhardi by having bluish petals, by the racemes being longer and with more numerous flowers and the flowers with ascending pedicels, was seen in ditches on the Southport Dunes, Lancashire 59, and has also been gathered by the writer near Galway and on Hampstead Norris in Berkshire 22. It occurs with the upper part of the stem glabrous or glandular; the latter is the var. *anagalliformis* (Bureau). *V. aquatica* Bernhardi has flowers usually white with pink veins, the flowering racemes are shorter with less crowded flowers, and with the flower pedicels nearly horizontal, the fruits are somewhat broader and shorter. This was seen at Cambridge 29, Norfolk 27, 28.

1940. *Euphrasia scotica* Wetts. Professor Wettstein confirms Professor Schroeter's determination of "*Euphrasia scotica*" from Ben Lawers as *E. minima*, an opinion independently arrived at by Dr. Ostenfeld.

1944. *E. salisburgensis* Funck sparingly near Roundstone 16, abundant near Ballyvaghan, Co. Clare 9.

1948. *Bartsia Odontites* Huds. The only form noticed in Norfolk 27, 28, Derby 57, Lancashire 59, Westmoreland 69, Cumberland 70, Perth 87, 88, 89, and in Galway and Kerry was *Odontites serotina* Bertol.

1956. *Rhinanthus Drummond-Hayi* Druce was gathered on Ben Lawers 88.

1960. *Melampyrum pratense* L. var. *hians* Druce. This beautiful form of the common Cow-wheat occurred plentifully in Honley Old Wood, York 163, and also most profusely at Killarney. This plant was unknown to the foreign visitors and it was considered by Professors Graebner and Schroeter to be a well marked subspecies.

[At Keswick the writer noticed that ants were carrying the wheat-like seeds about the wood in which the plant grew.]

1968. *Orobanche Hederae* Dubry., Mallow, Killarney: at the latter place also as an albino form.

1977. *Utricularia intermedia* Hayne. This was fairly common near Sutton Broad, Norfolk, E. 27, and was extremely abundant and luxuriant near Roundstone 16, where it was associated with *U. minor* L., but the new British species *U. ochroleuca* was not observed. The non-occurrence of the latter strengthens the view that it is a species, not a hybrid, since at Roundstone, *intermedia* and *minor* grow inextricably interlaced.

1992. **Mentha crispa* L. near Perranwell, Cornwall 1 quite naturalised: is it not *M. rotundifolia* × *spicata*?

1993. *Mentha piperita* L. Clifden, Galway. Near Kirkland, Cumberland 70.

1994. *M. aquatica* L. var. *minor* Sole. Under this variety comes a very small pretty prostrate form with capitate inflorescence which is abundant in the slacks of the Southport dunes† 59. It may be worthy of a distinct varietal name.

1996. × *Mentha verticillata* L. var. *elata* Host. †Penrose 1. var. *plicata* (Opiz.) †Penrose 1.

1999. *M. rubra* Sm. By the Tay at Perth 89.

2000. *M. arvensis* L. With the above 89.

2062. *Galeopsis Tetrahit* L. A white-flowered form occurred by the Tayside, E. Perth 89.

2099. *Plantago major* L. †var. *pubescens* Lange, Southport 59.

2101. *Littorella uniflora* Aschers. In abundance and barren at Killarney as the forma *isoetoides* Bolle: also at Haweswater 69.

2124. *Chenopodium album* L. Near the var. *glomerulosum* Reichb. Blakeney †28, and Greenfield, York †63.

2143. *Atriplex littoralis* L. Common on the embankment connecting Hayling Island with the mainland. Only the entire-leaved form was noticed.

2144. *Atriplex patula* L. Near Pilgrim Bridge, Lancashire 69 var. Blakeney 28. At Hayling Island 11 var.

2149. *A. Babingtonii* Woods. Blakeney 28, Dog's Bay, Galway.

2152. *Atriplex Portulacoides* L. (*Obione Portulacoides*). In two different modifications on the Blakeney marshes 28, one with paler inflorescences than the other and with narrower leaves. At Havant 11.

2157. *Salicornia lignosa* Woods. Abundant in many places in the north and west of Hayling Island 28. Often associated with the unnamed form of *S. europaea* referred to below.

2159. *Salicornia europaea* L. A distinct form of this species was gathered by Ostenfeld, Lindman and the writer at North Bull, Co. Dublin 21. An allied form grew at Galway 16. Typical examples of the species were gathered at Hayling Island, growing on the landward edge of the association of *Spartina Townsendi*. A variety or allied species was also seen in the same locality, characterised by extremely long, tapering, and often branched spikes, with the lateral flowers of the cyme often separated by the central one as in the perennial species. This form usually grows on the landward limits of salt-marshes.

2160. *S. ramosissima* Woods. North Bull, Co. Dublin 21, The Lizard 1. Locally abundant and characteristic in tidal ditches on the north shore of Hayling Island.

2161, bis. *S. disarticulata* Moss, Journ. of Bot., June 1911.

This newly described species was rather common in the general salt-marsh association to the north of Hayling Island. It is easily distinguished by its short and uniflorous "spikes."

2164. *Dondia fruticosa* Druce (*Suaeda fruticosa* Forskal). Shingle of Blakeney, in magnificent growth, nearly at its most northern station in Europe.

2166. *D. maritima* Druce (*Suaeda maritima*). Both in the erect and prostrate (var. *procumbens* Druce) conditions at Hayling Island; also a procumbent large seeded form with seeds ripening earlier which is probably the var. *macrocarpa* moquin.

2171. *Polygonum Bistorta* L. In meadows by the Teith Callander †87.

2200. *Rumex obtusifolius* × *nemorosus*=*R. Dufftii* Hausskn. Monsal Dale †57. Greenfield, York †63.

2207. *Rumex maritimus* L. Near Sutton Broad 27.

2210. *Rumex Acetosella* L. var. *angiocarpus* (Murbeck). The common plants of the British Isles. Noticed at Greenfield, York 63, Southport, Lancashire 59, near Penrith, Cumberland 70, near Whitbarrow, Westmoreland 69, Dunkeld 88, Perth, and at Perranwell, Cornwall 1.

2210. *Rumex Acetosa* L. var. *acetoselloides* (Bal.). Grew on Chewbrook Clough, above Greenfield †63, near the New Reservoir, pointed out by Dr. Ostenfeld.

2219. *Euphorbia hyberna* L. Common in fruit at Killarney.

2245. *Ulmus glabra* Miller. Tall trees nearly 100 feet high at *Mallow †5, *Killarney †2, *Callander †87. Probably planted in these localities.

2246. *U. stricta* Lindley. Near *Gort, Galway †15, Perranwell, etc. 1, near Beaulieu, etc. †11.

2246. *Ulmus hollandica* Miller. *Meltham †63, Mallow †5, Killarney †2, near Cork.

2247. *Humulus Lupulus* L. Near Clifden, close by a cottage, Galway †16.

2255. *Betula alba* L. (*B. verrucosa* Ehrh.). Plentiful near Honley 63, seen in Silverdale 69, Dunkeld 88, Aberfeldy 89, Trossachs 87, Killarney 2. But with this birch and *B. pubescens* were very numerous trees which could not be referred to either species. Some of these, as at Westwood 63 and Killarney, are probably true hybrids (*B. alba* × *pubescens*), but in addition there are several well marked varieties including *B. pubescens* Ehrh. var. *parvifolia* (Wimm.) and var. *carpathica* W. & K. and another distinct looking tree which is common at Killarney and is perhaps somewhat nearer to *B. verrucosa*. *B. pubescens* Ehrh. occurred near Woodbastwick 27, at Foulshaw Moor 69, Dunkeld 89, Aberfeldy 88, Trossachs 87.

2267. *Salix pentandra* L. In several localities near Clifden, Galway, but perhaps originally introduced.

2272. *S. daphnoides* Vill. var. **pomeranica** (Willd.). Planted doubtless near Southport 59. Professor Graebner named it as the above.

2276. *S. aurita* × *cineraria*=*S. lutescens* A. Kerner. Several bushes of this were seen in the Wessenden Valley, Yorks. †63, also near Dunkeld, Perth E. 89, and at Clifden, Co. Galway.

2291. *Populus nigra* L. Norfolk 127, 128, Meltham *|63. Large trees near Mallow †5.

2293. **P. canadensis* Mœnch=? *P. deltoides* Marsh. The common Black Italian Poplar. Commonly planted through England, South Scotland, and occasionally in Ireland as at Gort, near Limerick, etc.

2294. **P. candicans* Aiton. Planted at Greenfield #63, Southport 59, near Clifden, Galway #16.

2294 (3). **P. laurifolia* Ledel. Some suckers of this alien species were noticed at Woodsome Hall, York, 63.

2308. *Spiranthes spiralis* Rich. In great profusion at Roundstone 16, and at Ballyvaghan, Clare 9, and at the Lizard, at Perranwell 1 and Plymouth 3.

2315. *Helleborine palustris* Schrank. Southport Dunes in abundance, probably as the †var. *ericetorum* (Asch. & Graebn).

2316. *H. media* Druce. Monsal Dale 57.

2319. *H. atrorubens* Druce. Ballyvaghan, Co. Clare 9. A distinctly calcareous species.

2327. *Orchis maculata* L. var. *præcox* Webster. This was still in flower on August 8th in Crowden Clough 58. Comparative culture of this variety or species and the type is greatly needed, especially from seed. But it would be interesting to see what would happen if tubers of the type were grown in acid peaty soil, and those of *præcox* (*ericetorum*) in basic soils. The latter is the prevailing "*O. maculata*" of moors and heaths, the former of woodlands and pastures on basic or neutral soils. Where the soils are variable many intermediates occur, the question to be settled is whether these are natural hybrids, or soil-variations. At Ballyvaghan *O. maculata* var. *O'Kellyi* Druce, a pure white flowered plant with unspotted leaves and narrow lip divisions was over flower.

2341. *Habenaria intacta* Benth. Some fruiting spikes of this interesting plant were gathered in Co. Clare by Mr. Praeger, in this outlying area of its distribution where it is locally abundant. It flowers in June, the blossoms being usually greenish-white, not pink as figured in *English Botany*.

+**Tritonia crocosmiflora* Nicholson Gard. Dict., IV, 94, 1889. (*Montbretia crocosmæflora*=*Tritonia Pottsii* × *T. (Crocosmia) aurea*). This popular garden plant is becoming naturalised in Ireland. It is quite established near Clifden and Dr. Glück saw it near Ballynahinch. It also grew on the shores of Galway Bay 16, Killarney 2, and as a garden outcast it occurred near Carclew, Cornwall 1.

2390. **Asphodelus fistulosus* L. This European species was noticed by the writer on waste ground in Cambridge +29 and also on the shores of Galway Bay #16.

2426. *Juncus maritimus* Lam. At the back of the salt-marshes, Stiffkey, Norfolk. By the fresh-water stream above Kynance Cove 1.

2428. *Juncus conglomeratus* L. A very much scarcer plant in most districts than *J. effusus*, but typical specimens were seen at Dunkeld, near Roundstone and at Killarney.

2429. *J. effusus* L. was very abundant in most of the districts visited especially at Crowden Great Clough 58, Blackew 59 and on Crossfell 70. In both places it was associated with the var. **compactus** Lej. & Court., having more compact inflorescences, thus simulating *J. conglomeratus*, but a careful attention to the striation of the stem and the shape of the capsule, easily enable the two species to be distinguished.

2433. *J. subnodosus* Schrank was plentiful in the area of the Norfolk Broads and appears to prefer basic soils.

2435. *J. articulatus* L. var. *nigritellus* (D. Don) Southport 59.

2437. *J. bulbosus* L. var. *Kochii* (Schultz) Druce. Southport 59, Foulshaw 69, The Lizard 1, Roundstone, Galway. Usually this variety has six stamens but forms with four also occur; its upright habit distinguishes it from the type. The form *fluitans* also occurred in many of the Irish streams.

2440. *J. Gerardi* Lois. Common on the salt-marshes of the coast of Norfolk 28, Lancashire 59, Westmoreland 69, Dublin and Galway.

2441. *J. tenuis* Willd. This aggressive American species which is found yearly in new localities through Central Europe, was gathered on the road-side near Lawers 88.

2442, bis. **J. ranarius** Perr. & Song. Nees in *Linnæa* XX,

243, 1847. (*J. bufonius* var. *ranarius* (Nees)). In the damp hollows of the sand-dunes at †Southport 59. Professor Graebner says it is an analogous plant to *J. Gerardi* and bears the same relation to *bufonius* as the latter does to *compressus*. It keeps its characters of the shorter and broader capsules and of the shorter perianth-segments, etc. in cultivation. I collected it at the North Bull, Co. Dublin 21. [Mr. Travis also sends it me from Ainsdale, Lancashire 59].

2452. *Juncoides pilosum* Morong (*Luzula pilosa*). Ascending to over 2,200 feet on Ben Lawers, but with a different facies from the lowland plant.

2462. *Sparganium neglectum* Beeby. Silverdale 69.

2465. *S. natans* L. (*S. affine* Schnitz.) at the Trossachs 87, and with *S. minimum* Fries occurs in Loughs near Roundstone.

2476. *Alisma Plantago-aquatica* L. var. *latifolium* Kunth. Near Woodbastwick ‡27.

2477. *Echinodorus Ranunculoides* Engelm. Southport 59 var. *repens* (Davies) Killarney.

2479. *Sagittaria sagittifolia* L. with extremely narrow aerial leaves in the Broads, as at Barton, and Hoveton 27.

2485. *Potamogeton natans* L. × *P. polygonifolius* (Pourr.=*P. gessuacensis* Fisch.=*P. polygonifolius* f. *linearis* Syme). This plant grew in great abundance in the Swift Stream (Upper Range) between the Upper and Middle Lakes at Killarney, where it seems to be always sterile. The consensus of opinion expressed by those who saw it was that it was a sterile state of *P. natans*.

2486. *P. polygonifolius* Pourr. This was seen as the heath state near Perranwell (where it simulated to some degree *P. coloratus*) Cornwall, at Dunkeld, and as a very narrow-leaved form at Craigga More, Galway.

2489. *P. alpinus* Balb. Occurred in Loch na Chat, Lawers and also close to Lawers Pier, Mid-Perth.

2493. *P. graminus* L. (*heterophyllum*) Roundstone.

2503. *P. crispus* L. var. *serratus* (Huds.). Butterston Loch 89.

2508. *P. pusillus* L. As a small form at Roundstone.

2520. *Zostera marina* L. var. *angustifolia* Horn. Hayling Island with 2521 *Z. nana* Roth.

2525. *Aponogeton distachyum* Thunberg. An African species quite naturalised in a small Loch in the Dunkeld policies, E. Perth †89, where it was doubtless planted.

2526. *Eriocaulon septangulare* With. Extremely abundant in Connemara, and also occurring as a land form (*forma terrestris*) at Roundstone. Professor Glück is cultivating this form with a view to determining its status.

2552. *Rhyncospora fusca* Aiton. Very abundant about Craigga More, Galway.

2561. *Carex vesicaria* L. Near Dunkeld by Butterston Loch, Perth, E. 89, Banks of the Teith, Callander, Perth, W. 87, also a hybrid with *C. inflata* Huds. i.e., *C. Pannewitziana* Figg.

2565. *C. lasiocarpa* Ehrh. (*C. filiformis*). Marsh near Butterston Loch, Perth, E. 89.

2570. *C. helodes* Link. Near the Upper Lake, Killarney.

2576. *C. lepidocarpa* Tausch. Sutton Broad 27.

2577. *C. Cederi* Retz. Southport dunes 59, and also in the Norfolk Broads 27, in the latter place as a tall slender form, the var. *elatior* (And.)

2581. *C. ornithopoda* Willd. Monsal Dale 57, gathered by Dr. Ostenfeld.

2600. *C. elata* All. (*C. stricta* Good.). Abundant in the area of the Broads, sometimes forming large tussocks.

2639. **Setaria viridis* Beauv. Casual at Galway †16.

2642. *Spartina alterniflora* Lois. A local patch of this was seen at Warsach on the Hamble Creek, Southampton Water.

2643. ×*Spartina Townsendii* Groves. The immense masses of this aggressive form on the tidal mud, Hampshire Coast, was one of the most striking features from an ecological point of view, seen during the expedition.

2644. *S. stricta* Roth. is comparatively rare. North shore of Hayling Island, in company with *S. Townsendii*, which is dominant there as nearly everywhere else on these Hampshire coasts.

2684. *Agrostis alba* L. var. *stolonifera* (L.)= *proraepons* Koch. Southport 59, etc., North Bull, Co. Dublin.

2686. *A. setacea* Curtis. Plentiful on the Lizard heaths.

2709. *Deschampsia cæspitosa* Beauv. var. *alpina* Gaud. Ben Lawers 88.

2724. *Arrhenatherum tuberosum* (Gilib.) Druce (*A. avenaceum* var. *nodosum* Reichb.). Westwood, Yorks 63, Silverdale 69.

2741. *Koeleria britannica* (Domin). Silverdale †69, Roundstone Galway 16.

2745. *Molinia cærulea* Moench occurred with a peculiar interrupted inflorescence at Crowden Clough 58 and as the var. *depauperata* (Lindley) Blackchew 63 and on the moors near Craigga More, Galway.

2759. *Poa pratensis* L. an excellent var. *subcærulea* (Sm.) at Ballyvaghan.

2761. *P. trivialis* L. occurred on Ben Lawers in a peculiar form which is worth further study.

2762. *P. nemoralis* L. var. Killarney.

2769. *P. annua* L. as var *varia* Gaud. On Ben Lawers also as a strong perennial form.

2785. *Festuca rubra* L. This widely distributed species occurred in many forms, at Southport 59 probably as *arenaria* Osb., at Clifden and Roundstone probably as the var. *pruinosa* (Hackel), on Ben Lawers as the var. *megastachya* Gaud. and *barbata* (Hackel).

This grass in its various forms should be well studied by ecologists so that they may know it from forms of *F. ovina* L.

2787. *Festuca ovina* L. Over the greater part of Britain this is doubtless a rarer grass than *F. rubra*, with which it is much confused, but it is an abundant species on the chalk and limestone downs. On the peat moors it is often represented by the variety *paludosa* Gaudin (*F. tenuifolia* Sibth.) an awnless plant, and perhaps a good biological species. In recording *F. ovina* it is extremely important that the species should be authentically named, and also as to the special variety which occurs.

2818. *Brachypodium sylvaticum* Roem. & Schult. On the limestone at Ballyvaghan 9, this assumed much of the habit of *pinnatum*; it occurred also in the var. *glabrescens* Syme.

2827. \times *Agropyron Hackelii* Druce (=*A. junceum* \times *repens*=*A. acutum* auct. ang.=*Triticum acutum* auct. ang.). This hybrid grass was found near Blakeney 28 in small quantity, at Southport 59, but these much nearer *A. junceum*, and at North Bull, Co. Dublin. At Blakeney a possible hybrid *A. pungens* \times *repens* also occurred.

2828. *A. pungens* Roemer & Schult. This grass likes a stiffer soil than *junceum*, which is a plant of mobile sands, while this occurs on the borders of clayey salt-marshes. It was seen near Blakeney 28 and at Havant 11.

2830. *Agropyron repens* Beauv. var. An abundant and dominant plant in the grass vegetation bordering on the salt-marshes at Hayling Island, and especially near Burlesden Bridge, S. Hants; preferring shelter. The leaves are intensely glaucous. [The same form occurs near Boston, Lincolnshire.]

2160. *Juniperus communis* L. Common above Dunkeld, E. Perth 89 and near the Trossachs, W. Perth 87. In each place some forms approaching the so-called variety *coronata* occurred. Bow Hill, W. Sussex.

2861. *J. sibirica* Burgs. (=*J. nana* Willd.). Abundant on Urrisbeg, Co. Galway and descending to near sea-level.

2862. *Taxus baccata* L. Abundant on the limestone of Silverdale, where its luxuriance on a very dry looking limestone scree surprised some of the foreign visitors. Abundant in the Killarney woods. On the chalk of East Sussex and S. Hants, where it sometimes forms pure woods of considerable extent.

2874. *Equisetum variegatum* Schleicher. Southport 59.

2877. *Adiantum Capillus-Veneris* L. In great beauty in fissures of the limestone at Ballyvaghan, Co. Clare 9: the form with large pinnæ.

2880. *Asplenium marinum* L. In splendid condition near the Black Head, Co. Clare and also occurring at the Lizard, Cornwall 1. At the Lizard it grew close to *A. Adiantum-nigrum* and near by occurred a remarkable form intermediate in character suggesting the hybrid, *A. Adiantum-nigrum* \times *marinum*. Professor Graebner and Dr. Ostenfeld were also of this opinion, but Dr. Stansfield considers it an abnormal form of the Black Splesmont.

2885. *Asplenium acutum* Bory. Sparingly but in fine condition near Killarney and apparently a distinct species.

2893. *Polystichum aculeatum* Roth var. *lonchitoides* Deakin. Ballyvaghan, Co. Clare 19.

2900. *D. æmula* Kuntz at Killarney plentiful.

2907. *Polypodium vulgare* L. var. *semilacerum*, Mallow.

2916. *Hymenophyllum tunbrigense* Sm. and *H. peltatum* Desv.

abundant at the Trossachs 87 and at Killarney. A carpet-like sheet consisting almost entirely of *H. peltatum* 3 feet long by 18 inches was cut from a rock (where there was great abundance of it) for a museum specimen by Professor Schroeter.

2922. *Pilularia globulifera* L. Killarney. "Sparingly at the south end of Upper lake" *Cybele Hibernica*. This year with the lower water level the shore of the lake and of some stretches of the Upper Range were covered with a turf of this species; the different more yellow-green colour contrasting with similar expanses of *Littorella*, which were also exposed this year from the same cause.

2923. **Azolla caroliniana* Willd. In great abundance and fruiting freely near a garden at Woodbastwick, E. Norfolk 27, and also plentiful in brackish water near Queenstown Junction, Co. Cork 5, having spread from Mr. Beamish's adjoining garden.

Incomplete as the foregoing account of the floristic results of the International Phyto-Geographical Excursion of 1911 avowedly is, yet it contains much that is exceedingly interesting to the student of the British flora, while it emphasises the importance and desirability of more combined and critical work at the constituents of our flora than British botanists have hitherto given, and at the same time shows that even the more frequented areas have not yet yielded all their floristic secrets.

It may be desirable to give in fuller detail the actual additions to the British flora which were made on the expedition, bearing in mind, however, that in some instances the plants had already been distinguished, but not by the more correct name. Other cases are awaiting the results of a more complete examination.

ADDITIONS TO THE BRITISH FLORA.

77 (2). *Castalia alba* Wood var. *candida* (Presl). Syn. *C. candida* Schinz & Thellung, Fl. der Schweiz, 1909. *Nymphaea candida* Presl, J. & C., Delic. Prag, 224, 1822. *N. alba* var. *oocarpa*. Caspary in Ind. Sem. Hort. Berol. App. 27, 1855. *N. alba* var. *candida* Borbas Buda Korn. Nova 191, 1879.

The description (abbreviated) from that given by Conard Waterlilies 172-3, t. 20-22, 1905, is as follows:—

Flower 6-13 cm. Sepals 4-5 oblong or ovate-oblong (3-8 x 1-3 cm.) narrowed at apex, acute or obtuse, about 7-veined, green outside, white within. Petals 12-20 white, nerved, outer ones nearly as long as sepals. Stamens 32-70, shorter than in *alba*, orange yellow, filaments lanceolate (outer) to linear-lanceolate (inner), long acuminate, never narrower than anthers, usually inserted only on the sides, not on the summit of the ovary. Pollen granulate with smooth operculum, larger than in *alba*. Ovary ovate or roundish, usually contracted and destitute of stamen insertions below the stigma. Carpels 5-14. Fruit ovoid or spherical. Seed larger than in *alba*, elipsoid, brownish, 0.3 cm. long. Leaf cleft at base to petiole, sub-orbicular to oval, 10-30 cm. long, 25 cm. wide, entire, lobes nearly equal, inner margins curved overlapping a little above, and spreading out towards periphery of leaf (or straight and parallel or touching), angles more or less acute. Veins on underside

of leaf persistent, the lowest pair (*i.e.* those running into the lobes) curved and if produced would cross inclosing an *oval* area.

Loch, Dunkeld, E. Perth, Dr. Ostenfeld. Loughs, Craigga More and Roundstone, Galway, Ostenfeld and Druce.

399. *Sagina nodosa* Fenzl var. *monilifera* Lange. See Ascherson and Graebner, *Flora des Nordostdeutschen Flachlandes*, 30 and 843, 1898.

In this plant the leaf-axils of the lateral stems develop fascicles of small leaves, which drop off and readily take root in suitable conditions. This peculiar modification seems to be more readily induced in bare wind-swept places and the writer has in his herbarium illustrative examples from Braunton Burrows, N. Devon 4; North Warborough, Hants 12; Marcham, Berks 22; Port Meadow, Oxford 23; Near Yarmouth, Norfolk E. 27; Barmouth, Merioneth 48; Aberfraw, Anglesey 52; Southport, Lancashire 59, Portumna, Clare, Galway, North Bull, Dublin and Gweedore, Donegal.

403 (2). *Sagina glabra* Koch Syn. 439, 1842 var. *scotica* nov. var. Ben Lawers, Mid-Perth 88.

Planta elongata, foliis filiformibus, subaristatis, axillaribus fasciculatis, pedunculis solitariis pubescentibus cernuis, petalis calyce duplo longioribus. Habitu laxo, extenso floreque magno, folia omnia elongata.

The above plant differs from *S. saginoides*, with which it has been confounded, by the more creeping growth, longer petals and smaller capsule. The subligneous root stock and creeping-decumbent habit distinguish it from *S. subulata*, while the pentamerous flowers and long petals separate it from *S. procumbens*. From typical *S. glabra* the above plant differs by its smaller and slightly shorter capsules. Professor Graebner thinks my suggestion as to the name it shall bear a very probable one, but we await Professor Schroeter's report on his examination of it with much interest.

The writer has a similar plant from Glen Callater, S. Aberdeen-shire, and others exist in the Herbarium at Oxford, labelled *S. Linnæi* from Ben Lawers, and a sheet of it collected from the same mountain by Professor Babington at Cambridge was first labelled *S. procumbens* and then altered to *S. saxatilis* (= *S. Linnæi* = *S. saginoides*).

488 var. *Geranium Robertianum* L. var. *villarsianum* (Jordan in Cat. Grenoble, 1849) as a species = *G. purpureum* Vill. Fl. Dauph. iii., 374, t. 40 pro parte. This differs from *G. modestum* and *G. purpuratum* by its prostrate growth, by its smaller size, its usually green flattish leaves and slight odour. Specimens from the calcareous district of Ballyvaghan are almost identical with Jordan's type, which by the kindness of Dr. Moss I have been enabled to examine in the Cambridge Herbarium. Jordan's description is appended :—

"*G. pedunculis bifloris, inferioribus folia vix æquantibus, sepalis dense glanduloso-hispidis dorso convexis late costato trinerviis latiusculæ membranaceo-marginatis aristatis, petalorum limbo parvo lœte purpureo oblongo-obovato unguem suum fere a basi anguste alatum æquante, antheris flavis orbiculato-bilobis stigmata pallide purpurea vix æquantibus, fructus rostro 4-5 lin. (10-12 mm.) longo, carpellis mox deciduis rubellis glabris dense rugoso-costatis, rugis superioribus*

transversalibus crassis approximatis vix apice ramulosis, inferioribus obsolete areolatis vel subverticalibus, semine parvo ovoideo lævi, foliis parvis intense virentibus crassiulus planis circumscriptione rotundato-pentagonis subquinatis, partitionibus petiolulatis ovatis profunde pinnatifidis, lobis paucis distantibus obtusis mucronulatis integris vel subdentatis, caule humili erecto simplici vel diffuse ramoso, ramis ascendentibus undique patenter glanduloso-villosis, radice bienni.

Hab. in locis saxosis et rupestribus montium calcarearum. Caulis vix ultra sex pollices altus, odor lævis.

A *G. Robertiano* plane differt floribus duplo minoribus, carpellis magis rugosis, foliis parvis minus dissectis et fere crassioribus, habitu valde humiliore diffuso.

A *G. modesto* Jord. discedit sepalis multo longius pilosis magis dorso convexis, petalis latioribus minus oblongis ungue suo haud longioribus fructu rostro breviore, carpellis mox deciduis nec diutius suspensis, rugis eorum crassioribus, foliis obscure virentibus minus dissectis, hispiditate longiore, habitu humiliore diffuso."

519. *Rhamnus catharticus* L. var. *Schroeteri* nov. var. Silverdale, Lancashire. Arbor parva (3-4m. alta). Foliis ovalibus orbiculis, flave-viridibus, acuminatis (25-30 mm. longis 15-20 latis), supra infraque dense pilosis; petiolis dense pubescentibus; fructus cum pedunculis hirsutis.

The pubescence is of such a nature as to appear mealy, and the whole foliage appeared of a dusty yellowish tint, quite unlike that of the midland plant. Professor Schroeter, who first drew attention to this example, has kindly sent me a specimen of *Rhamnus Villarsii* Jordan, itself more hairy than the type, but he agrees with me in thinking the British plant quite distinct from Jordan's species from Fribourg.

909. *Alchemilla vulgaris* L. var. *acutidens* (Buser as a species) Briquet. We await Dr. Ostenfeld's notes on this plant, which he showed to the party on the ascent of Ben Lawers.

1042. *Peplis portula* L. var. *dentata* nov. var. Killarney, Co. Kerry. This form which was first gathered by the writer in the Black Valley, Co. Kerry, in 1875, subsequently at Boscastle, Cornwall, and again this year with the Excursion, differs from the type in having much longer teeth to the calyx and may be described "Dentibus calycis capsula (1 mm. vel. ultra) longioribus." It forms a passage to the Mediterranean and Western variety *longidentata* J. Gay, and is especially interesting as affording another link with the Iberian flora.

1434. *Cirsium palustre* Scop. var. *ferox* nov. var. Crossfell, etc. This extremely spinous variety was seen in many places on the Excursion and the members agreed in considering it distinct. It may be defined as:—Planta robusta (40-60 cm. alta), pallide viridis, spinosissima, cum pallide-flavis spinis (fortibus). Capitulis pallidis-roseis vel albis; floribus, in densis racemis terminalibus aggregatis. Phyllariis pallidis cinereis-viridibus, externalibus forti spina terminatis, parte media viscida, fulgida subnigra, paucis pilis glandulosis: phyllariis superioribus in apice plane scariosa terminatis.

Doubtless the drought and sunny weather of this abnormal season would tend to reduce the vegetative growth and thus produce a more

spinous condition than in wet years, but the characters of this plant appeared to be to some degree independent of these factors. Cultural experiments are however much to be desired, to see if the features of the variety are constant.

1638. *Hieracium umbellatum* L. var. *dunale* G. Meyer. *Chlor. Hannov.* 421, 1836; var. *armeriifolium* G. Meyer in *Hann. Mag.* 170, 1824—*H. dunense* Reymer in v. Hall. *Fl. Belg.* i., 556. Southport Dunes 59, named by Professor Graebner and assented to by Dr. Ostenfeld. Rouy & Foucaud (*Flore France* ix., 401) say this plant is identical with *H. littoreum* Lindberg, not Arvet-Touvet, which is the var. *littorale* from the Jersey dunes.

1693. *Calluna vulgaris* Hull var. *Erikae* Aschers. & Graebn., *Fl. Nord.* Flachs. 547. 1898-99, where it is defined “B. breit, flach, beiderseits rinnig.” Its procumbent form makes it a desirable plant for the rock garden. Dr. Church in his excellent *Floral Mechanisms*, p. 147, describes and figures the inflorescence of this variety, which he found at Cape Cornwall, and shows that visiting insects crawl underneath the plant, between the flowers, which are turned downwards, and the ground. Although more frequent in exposed and wind-swept places it is by no means confined to them as it often grows with the typical plant.

1695. *Erica Tetralix* × *vagans*—*E. Williamsii* Druce in *Gard. Chron.*, December 2nd, 1911—*E. cinerea* × *vagans* Davey in *Journ. Bot.* 333, 1910—*E. vagans* × *tetralix* Turrill in *Kew Bull.*, 378, 1911, see preceding page.

1912. *Veronica Anagallis-aquatica* L. em. Asch. & Graebn. *Fl. Nord.* Flach. 635. 1898-99, diagnosed as “St. aufrecht od. aus liegendem Grunde aufrecht, einfach od. ästig, fast 4kantig; B. länglich-lanzettlich bis lanzettlich, sitzend, halbst. umfassend, entfernt-kleingesägt; Trauben vielbth, etwas locker, zerstreut drüsenha.; Bth.-stiele länger als das Tragb. u der K. in der F. abstehend; Bl.-kr. bläulichweiss, mit dunkleren Adern; Kapsel rundlich.

1912 bis. *V. aquatica* Bernh. This is the common plant of Great Britain and Ireland and is defined by the foregoing authors as:—B. oft röthlich überlaufen (Scholz); Bth. kleiner; Bl. kr. weisslich-rosa; F.-stiele derber, ziemlich starr, wagerecht abstehend, daher der F. stand sehr locker; Kapsel elliptisch.” The *Index Kewensis* gives *V. aquatica* Benquerel in *Neuch Bull.* V. 449, 1859-61.

2429. *Juncus effusus* L. var. *compactus* Lejeune & Courtois, p. *Fl. Belg.* ii., 23, p. 131. This form, which is often mistaken for *J. conglomeratus*, differs from the type of *J. effusus* by the inflorescence, even at maturity being condensed into a globular head, with the internodes very reduced; but intermediate stages occur.

2442 (2). *Juncus ranarius* Nees in *Linnæa* XX., 243, 140 (teste *Ind. Kew.*) emend Song & Perrier in *Billot Annot. Fl. Fr. et. Allem.* 192, 1859. This plant, which in Britain has either been confused with or called var. *fasciculatus* of *Juncus bufonius*, is stated by Professor Graebner to be a good species, a view also held by Buchenau, the monographer of the genus. Ascherson & Graebner (*Fl. Nord. Flach.* 175, 1898-9), thus describe it:—“H. 5-23 cm. Bth. häufig zu 2-3 genähert; innere P.-b. etwas kürzer, äussere so lang od. etwas länger als die am Grunde deutlich schmälere Kapsel; I

have it also from the Lizard, Cornwall 1; Braunton Burrows, Devon 4; Lydd, Kent 15; Yarmouth, Norfolk, E. 27; Tenby, Pembroke 45; Holyhead, Anglesea, 52; Holy Isle, 67; Kinross, Fife, 85; Sands of Barry, Forfar 90; Kishorn, W. Ross 105; Betty Hill, Sutherland 107; North Bull, Dublin; Newcastle, Co. Down.

Four Alien plants not in my *List of British Plants* were also gathered on the Excursion, viz., *Saponaria orientalis* L., an eastern species introduced with other Aliens at Galway Bay; *Populus laurifolius* Ledeb., the remains of cultivation in the Earl of Dartmouth's grounds at Woodsome Hall, near Huddersfield, Yorks; *Tritonia crocosmiiflora* Nicholson, a garden hybrid rapidly becoming naturalised in Western Ireland; and the variety of the Violet Willow, *Salix daphnoides* Vill. var. *pomeranica* (Willdenow), which is evidently planted at Southport. The last was identified by Professor Graebner.

G. CLARIDGE DRUCE.

IV.—IMPRESSIONS OF THE FOREIGN MEMBERS OF THE PARTY

1.—PROFESSOR H. C. COWLES.

It is too early to determine the most striking results of this excursion to the science of Photogeography, but it is not too early to predict with certainty that its influence will be very important and far-reaching. It is easier to distinguish the benefits of the excursion to its participants than to the science in general. I have felt that the chief benefit to me has been the opportunity of living for a month in intimate relationship with my phytogeographic colleagues of other countries, of knowing them from many points of view, and thus of coming to feel that they are friends, as well as fellow scientists. This month of living and travelling together

made us much better acquainted with each other's views and field interpretations, and also made it possible to read each other's writings much more understandingly than heretofore. Close companionship has made us more sympathetic with opposing viewpoints, and more ready to see at least some truth in views we thought were wholly wrong. Such results must come from every excursion of this sort, and if only we have enough of them to bring all the active phytogeographers of the world into sympathetic touch with others of their kind, we may hope soon to see a marked diminution in the misunderstanding of view-points, and in the amount of polemic literature. It is from such intimate acquaintance-ship among the workers and, perhaps, only thus that we may hope for constructive advances in securing uniformity of terms and methods. For example, it is difficult for an American to understand from the literature the precise signification of such terms as heath or moor, but in the field last summer these and other terms of the European workers were so often illustrated by concrete examples that they became thoroughly familiar.

As an American, I was, of course, much interested in seeing intelligently new kinds of vegetation. To the European members of the party this joy was much less possible, although there seemed to be points of considerable variance, even with Continental Europe. I was amazed at the vast amount of wild country in densely populated England. The extensive areas of the Broads, the sand-dunes and salt-marshes, the numerous heaths and moorlands, were more widespread and much more natural than I had expected them to be. While America may be more fortunate than Europe in the possession of great natural formations of plants, I was fully convinced that in the British Isles, at least, there is quite enough to occupy phytogeographic students actively for a long time to come. Many successional series were observed, whose progression or retrogression was quite as evident as in American formations, and to whose significance the British workers are fully alive.

I cannot close these rambling notes without expressing my admiration for the splendid organization of the British plant geographers. Doubtless it is largely this that has enabled them to accomplish so much in so short a time. My admiration for British social customs, as we saw them, is also very great. The hearty greetings that met us everywhere, the interest expressed in our work on the part even of those who could know little of it, the constant display of whole-souled British hospitality—all these things and many more have made August, 1911, a most memorable period in our lives.

HENRY C. COWLES.

The University of Chicago.

2.—PROFESSOR JEAN MASSART.

Les points qui m'ont frappé le plus vivement pendant l'excursion sont les suivants.

1. L'abondance et la beauté des grands arbres, surtout des chênes, qui vivent partout entre les champs et au bord des chemins.

2. La douceur extraordinaire du climat, permettant de cultiver en plein air: (a) à Cambridge, *Eucalyptus Gunnii*, *Viburnum Tinus*, *Quercus Ilex*; (b) presque dans les Highlands *Araucaria excelsa*, *Tropaeolum speciosum*; (c) en Irlande *Passiflora cærulea*, *Bambusa fastuosa*, *Musa Bajoo*, *Cordyline australis*; (d) en Cornouaille, des fougères arborescentes (*Dicksonia antarctica*).

C'est surtout en Irlande et en Cornouaille que le caractère maritime du climat est accentué: *Arbutus Unedo*, *Potentilla fruticosa*, *Erica vagans*, *E. ciliaris*. Les fougères et les *Saxifraga* vivent en épiphytes à Killarney.

3. La présence d'espèces alpines et subalpines au niveau de la plaine: (a) *Selaginella spinulosa*, *Pinguicula vulgaris*, *Primula farinosa*, à Haweswater Lake (en Silverdale, Lancashire du nord); (b) *Dryas octopetala*, *Arctostaphylos alpina*, *Empetrum nigrum*, à Ballyvaghan (en Irlande de l'ouest).

4. L'étendue des espaces qui sont laissés incultes pour le gibier, et qui sont couverts, soit de *Pteridium aquilinum*, *Nardus stricta*, etc., soit de tourbières sèches avec *Eriophorum vaginatum*, *Rubus Chamæmorus*, *Empetrum nigrum*, etc.

5. La présence d'anciennes forêts dans ces tourbières.

6. La grande extension de *Rhacomitrium lanuginosum* sur les montagnes (Cross Fell et Ben Lawers), et les touffes, curieusement modelées par le vent, de cette même mousse sur le plateau de Cross Fell.

7. Les plantes aquatiques submergées de la Cam, à Cambridge: *Scirpus lacustris*, *Sagittaria sagittifolia*, *Œnanthe fluviatilis*.

8. Dans les Norfolk Broads: (a) l'envahissement de l'eau par les plantes aquatiques, et la création de prairies branlantes; (b) les "carrs" où la végétation est vierge de toute intervention humaine.

9. La rencontre, à Blakeney Point, en Norfolk, d'espèces meridionales (*Succa fruticosa*, *Frankenia pulverulenta*) et d'espèces septentrionales (*Mertensia maritima*).

10. Dans les dunes de Southport, la similitude de la flore des collines de sable et des pannes, avec celle des dunes littorales de Belgique.

11. La variété de la flore alpine de Ben Lawers.

12. La présence de bois de *Taxus* sur le calcaire (Silverdale, Lancashire du nord) et sur la craie (près de Chichester).

13. L'abondance de plantes calcifuges sur le calcaire en Silverdale et à Ballyvaghan, notamment *Pteridium* et *Calluna*.

14. *Last not least*, l'amabilité et la grande compétence des botanistes anglais, qui nous ont permis de voir enormément de choses en un mois.

J. MASSART.

Université de Bruxelles.

3.—PROFESSOR C. A. M. LINDMAN.

MY DEAR TANSLEY,

IN a recent number of THE NEW PHYTOLOGIST you gave a full account of the International Phytogeographical Excursion in the British Isles of this year. This forms very pleasant reading for the foreign members of the party. Your description will give them a solid and instructive souvenir of this interesting tour.

As one of the foreign botanists I beg you to allow me to express in your Journal some general impressions of the "I.P.E." in 1911.

The vegetation of your country has only one defect, a defect that is shared by our own: they are both out of the way, neither country lies on any great European route, and so they are not well known to the botanists of the Continent. For instance, the Royal Botanic Museum at Stockholm—well filled with collections from most countries, brought home by keen Swedish floristic botanists and travellers—still lacks herbarium specimens from the British Isles, except a few sheets sent by J. E. Smith, and, in later times by the brothers Linton and Groves. A more frequent intercourse across the North Sea would be useful to contribute to the understanding of various floristic and phytogeographical questions, and to clear up several confusions. No doubt then a properly organized trip through the British Isles must be a first-class event in European phytogeography and a great attraction to any foreign naturalist. So I found it, and I can truly say that I saw and learned much more during the excursion than I ever expected. And I gladly testify, on my own behalf, and on behalf of my colleagues, that however much we had seen in different countries, we still found many peculiarities in the British vegetation, which are not to be seen elsewhere, and many features, which are as striking and interesting as any we have ever met with.

This, I think, may be said of the objects of the very first excursions, the vast fens, carrs and broads of Norfolk; and the same is true of the lonely moors and hillpastures of the Pennines, the shingle banks along the sea-shores, the great chalk-slopes of Kingley Vale in Sussex, with their wonderful yew woods, the dripping sub-tropical fern-clefts of Killarney, and the remarkable plains of Galway and of Cornwall, where the singular scenery is emphasised by the strange peculiarities of the flora.

Indeed, if only a part of this abundance had been offered to us we might have felt quite satisfied and surprised. But, by the skilful organisation of the British Vegetation Committee, and by the aid of many other persons and institutions, we were easily able to see the most interesting things and the most beautiful scenery in Great Britain and Ireland, that botanists would want to know. And we all assuredly recognized that the whole excursion was arranged *crescendo*, continually passing to more interesting subjects, more pregnant plant formations, and more striking scenery. Hence the lustre of your "I.P.E.," heightened by the experience of the never failing sunshine of the brightest British summer in the memory of man.

My own observations are perhaps but little important, but I made a good many, both ecological and floristic. I shall not, however, mention them to-day. I will only add that I appreciated very much the many occasions of getting acquainted with British botanists and of seeing them at their work. I am also indebted to you all for much kindness and courtesy.

C. A. M. LINDMAN,

STOCKHOLM,

Director of the Royal Botanic Museum.

December, 1911.

V.—THE KILLARNEY WOODS

(CO. KERRY, IRELAND).

IT was a great delight to be invited to join the "I.P.E." through the British Isles and my high expectations were fully realised. I have to thank my British friends for this wonderful summer.

The present article is in reponse to a request from my friend Tansley to write a contribution for a souvenir-collection of impressions of the members of the party, and to choose any points which struck me most in the vegetation. Professor Cowles' general impressions (NEW PHYT., Jan., 1912, p. 25) are exactly mine, and the points Professor Massart has enumerated as those which struck him the most vividly, affected me in exactly the same way. I shall not repeat these impressions, but rather pick out from the numerous interesting things we saw the woods of Killarney, in Co. Kerry, Ireland, which strike me as distinctly subtropical in character, and compare them with similar woods I have visited.

We spent August 25th, 1911, a very enjoyable day, in the beautiful Oak-holly-woods near the Upper Lake of Killarney. The dominant tree is *Quercus sessiliflora* which reminds us that we are in north-western Europe. This is confirmed by a few of its associates such as *Betula pubescens*, *Salix cinerea*, *Prunus spinosa*, *Corylus*, etc. But these are quite accessory, the striking feature in this deciduous oak wood being the glittering, shining, effect produced by the reflection of light which takes place in the second layer of the wood. The smaller trees and the shrubs in fact have shiny leaves, and you fancy yourself in the southern country of evergreen *Laurel* woods. The holly, *Ilex Aquifolium*, is the general dominant, and specially contributes to this effect. Frequently interspersed

and locally even dominant we find one of the most interesting woody plants of Ireland, the strawberry-tree, *Arbutus Unedo*, directing our thoughts to the West Mediterranean. This species embellishes the Killarney woods, not only as a shrub of 3-5 m. in height, as we are used to seeing it in Corsica, but as a tree of considerable height. The largest tree I saw, I judged to be 10 m. high, and this had a circumference of 180 cm. round the stem, taken 50 cm. above the ground, and 110 cm. taken at a height of 1 m. Another laurel-leaved plant, *Rhododendron ponticum*, catches your eye by its luxuriance. It is not native, but it spreads sub-spontaneously and evidently feels quite at home here. The many epiphytes give a nearly tropical aspect to the woods; the oaks bear epiphytically *Polypodium vulgare*, *Geranium Robertianum*, *Ilex Aquifolium* and *Saxifraga umbrosa*. Even *Rhododendron ponticum* ascends the lofty habitat of a branch of *Prunus lusitanica*, a planted tree native in the Canary woods. Very striking also are the masses of the thin-leaved *Hymenophyllum tunbridgense* and *peltatum*; and in this fern-sward we find a plant of *Sedum anglicum*!

When we look at the luxuriant heathy undergrowth, other countries come to mind. *Calluna* bushes I measured had a height of about 2 m., the tallest I found was 220 cm. high, giving the illusion of a "Monte verde" of the Canaries, or of the mountain heaths of Corsica, where *Erica arborea* and other species cover great tracts of country.

How shall we account for all these phenomena? Let me give the plant-list I made in this wood and then try to find an explanation.

The Oak-holly-wood near the Upper Lake at Killarney had the following composition: (the underlying rock was Old Red Sandstone).

<i>Quercus sessiliflora</i> , d ¹ .	<i>Hedera Helix</i> , a.
<i>Ilex Aquifolium</i> , sd.	<i>Viburnum Opulus</i> , o.
<i>Arbutus Unedo</i> , f.	<i>Taxus baccata</i> , o.
<i>Rhododendron ponticum</i> (subspontaneous), f.	

Hymenophyllum tunbridgense. *Hymenophyllum peltatum.*

Betula pubescens. *Prunus spinosa.*

Alnus rotundifolia. *Corylus Avellana.*

Salix cinerea. *Sorbus aucuparia.*

¹d.=dominant; sd.=sub-dominant; a=abundant; f=frequent; o=occasional.

<i>Calluna vulgaris</i> , a.	<i>Pteridium aquilinum</i> , a.
<i>Vaccinium Myrtillus</i> , a.	<i>Ulex Gallii</i> , o.
<i>Erica cinerea</i> , o.	
<hr/>	
<i>Luzula silvatica</i> , sd.	<i>Potentilla erecta</i> .
<i>Agrostis tenuis</i> , sd.	<i>Rubus</i> spp.
<i>Sieglungia decumbens</i> , ld.	<i>Geranium Robertianum</i> .
<i>Sphagnum acutifolium</i> .	<i>Oxalis Acetosella</i> .
,, <i>cymbifolium</i> .	<i>Euphorbia hiberna</i> .
<i>Dryopteris Filix-mas</i> .	<i>Viola silvestris</i> v. <i>pseudomirabilis</i> .
,, <i>ænula</i> .	,, <i>palustris</i> .
,, <i>spinulosa</i> sub-sp.	<i>Circeæ lutetiana</i> .
<i>dilatata</i> .	<i>Sanicula europaea</i> .
<i>Blechnum boreale</i> .	<i>Teucrium Scordonia</i> .
<i>Polyodium vulgare</i> .	<i>Scutellaria minor</i> .
<i>Osmunda regalis</i> .	<i>Prunella vulgaris</i> .
<i>Anthoxanthum odoratum</i> .	<i>Veronica officinalis</i> .
<i>Brachypodium silvaticum</i> .	<i>Melampyrum pratense</i> v. <i>hians</i> .
<i>Dactylis glomerata</i> .	<i>Lonicera Periclymenum</i> .
<i>Molinia cærulea</i> .	<i>Succisa pratensis</i> .
<i>Carex remota</i> .	<i>Knautia arvensis</i> .
,, <i>pallescens</i> .	<i>Solidago Virga-aurea</i> .
<i>Sedum anglicum</i> .	<i>Centaurea nigra</i> .
<i>Saxifraga umbrosa</i> , a.	<i>Hypochaeris radicata</i> .

Southwest Ireland has a *cool* and *very oceanic climate*. These two factors constitute a great difficulty in the study of the ecology of the vegetation, as this climate tends to "Cosmopolitanism," i.e. vegetation of very different range occurs together. Types of vegetation separated in a warm climate in several altitudinal belts converge and mix in cooler regions, because the basal vegetation extends northwards and at the same time the mountain vegetation descends more and more. In a continental climate the vegetation lines run far apart and each belt can easily be studied separately, while in the oceanic climate the lines merge; for instance the alpine vegetation descends and mixes with montane or even with coastal plants.

To get the key for the cool oceanic Killarney woods we must look for comparisons in a little warmer or a little less oceanic region.

Enjoying these beautiful Oak-holly-woods I was strongly reminded of similar communities I have studied in southern regions. What is united in Ireland is dispersed in the South in

several belts. Let us compare the climate of Killarney with that of these regions I have in mind—the *Atlantic laurineous woods*, the “*Monte verde*” or *ericaceous scrub* of the *mountains of Teneriffe*, the *Beech-pine-holly-wood* and the *Arbutus scrub* of the *mountains of Corsica*.

Unfortunately meteorological data of all these regions are scarce, as Killarney has no old meteorological station and the stations of the southern regions compared are nearly all located in other than the desired mountain belts, but we can calculate the data approximately from those we have and from our own experience.

Killarney has a January isotherm¹ of about 7°C and a July isotherm of about 15·3°C, which gives an annual range of only 8½°C; frost is practically unknown: the rainfall is enormous, about 2000 mm. per annum, and the air nearly always moist. The climate of the laurel woods² and of the heaths of Teneriffe is very similar to that of Killarney, only a little warmer. Having no meteorological station in the woods we must start from the basal belt. Orotava at 100 m. has a mean temperature of 19·0°C, and a range of 8·7°C between the means of January and July (14·6°, 23·3°). The cloudy belt which bears the woods (between 500 and 1100 m.) and the heaths (between 500 and 1300 m.) may have means around 13°C, a little more than Killarney; the extremes of monthly means about the same (8-9°C), perhaps a little less in the laurel wood, a little more in the heath, which is not quite so much centred in the cloud-belt. The relative humidity is very great, even the dry basal station of Orotava having a summer mean of 82%. The similarity is reflected in the vegetation. *Hymenophyllum tunbridgense*, *Polypodium vulgare*, *Pteridium aquilinum* are all present; *Hedera Helix* creeps on the ground in masses. *Arbutus Unedo* is replaced by a near relative, *Arbutus canariensis*; instead of *Ilex Aquifolium* we find the more southern species *Ilex canariensis* and *platyphyllus*, playing the same rôle. *Erica arborea* and other ericaceous shrubs take the place of the less heat-demanding *Calluna* and *Erica cinerea*. The relationship is clear: the similarity lies in the same oceanic climate, the difference in the temperature.

To turn now to the Mediterranean. The pure Mediterranean climate is mild in winter but hot and dry in summer, especially on the coasts. Corsica is modified in the insular, i.e. oceanic, direction.

¹ See map in R. L. Praeger: A tourist's flora of the west of Ireland, Dublin, 1909, p. 5.

² H. Schenck: Beiträge zur Kenntnis der Vegetation der Canarischen Inseln, 1907, and J. Hann: Handbuch der Klimologie 1897.

For instance, the mean humidity of the year at Ajaccio is as high as 80%, dew is very frequent, the mean yearly temperature of 17·6°C varies from 10·2 to 25·6°C from January to July. Rainfall is small, about 630 mm. When we ascend the mountains the rainfall increases, the mean temperature diminishes and the extremes approach. The most luxuriant *Arbutus Unedo*-association we find from 200-700 m., where the insularity or oceanic character of the climate begins to be more pronounced. If we go higher up in the Corsican mountains we come to the Vizzavona Pass, with beautiful beech-holly-woods (900-1300 m.) which vividly remind us of Killarney. The winters are cooler than in Ireland, snow lies there for several months of the year. There is no *Arbutus*,¹ and of course no *Hymenophyllum*, but we still have the sub-dominant *Ilex Aquifolium*. Some plants of the undergrowth we meet again: *Pteridium*, *Sanicula europaea*, *Hedera*, *Polypodium*, *Teucrium Scordonia*. The oak is replaced by the beech, the same phenomenon we see all over Europe, the oak as the tree of the pronounced oceanic climate; the beech of medium moisture and moderate extremes of temperature, in other words the medium climate which we find in South-east England, in South Germany, the Swiss Plain and the Corsican mountains.

CONCLUSION.

The extreme oceanic character of the climate of Ireland, which brings the alpines down to the seashore, mixing them with southern plants, unites in the Killarney woods elements which in a warmer or less oceanic country form different formations in different altitudinal belts between 200 and 1400 m. The *Atlantic laurineous wood*, the *Canary heath*, the *insular Macchia* (this laurineous community contrasted with the continental *máquis* of sclerophyllous, hairy-leaved scrub), the *Corsican beech-holly-wood*, all show great affinities to the Irish *Quercetum sessilifloræ laurineum* or *Quercetum sessilifloræ aquifoliosum* as we might call it. This seems to me to be the key to the striking features of the Killarney woods which we enjoyed on our glorious trip through the British Isles on the International Phytogeographical Excursion of 1911.

ZÜRICH,

E. A. RÜBEL.

February, 1912.

¹ M. Rikli (Botanische Reisestudien auf einer Frühlingsfahrt durch Korsika, 1907, p. 38) found the last *Arbutus* near Vizzavona at 850 m.

VI—SOME REMARKS ON THE FLORISTIC RESULTS OF
THE EXCURSION.

OWING to the excellent manner in which Mr. Tansley had arranged the conditions for preparing herbarium plants during our excursion, it was possible, in spite of the short time, to make ample collections at all points of our extensive trip. To me it was of special interest to get as many British plants as possible, as I was anxious to compare them with more northern and with Danish plants. I devoted special attention to the forms of the more critical species, and have brought home a large number of such plants. My leading idea in so doing is that a study of the geographical distribution of the "elementary" species or forms may be of value with regard to the interpretation of the immigration of the postglacial flora and the paths which this may have followed. As illustrations of my point of view the two races of *Helianthemum nummularium*, viz., var. *hirsutum* and var. *tomentosum* may be cited. In Denmark we have the former almost alone, while in the British Isles only the latter is found; this means that one variety has travelled in a western direction, the other in a northern, since both occur in Central Europe. Very much the same is the case with the two varieties of *Lamium galeobdolon*, of which var.

montanum is British, var. *vulgare* is more eastern and northern (Denmark and South Scandinavia). In other instances the British Isles have the same variety or species as Scandinavia, e.g., *Alchemilla acutidens* and *Erigeron borealis*. Such is the case with regard to the more northern forms, which must have come to the British Isles soon after the Ice-age and which are now confined to their northern and "alpine" regions, while they also occur in the Scandinavian mountains. In yet other instances the British Isles harbour more than one race, e.g., *Scirpus cæspitosus* var. *austriacus* and var. *germanicus*, and *Rumex acetosella* var. *acetoselloides* and var. *angiocarpus*, which have different geographical distributions elsewhere.

These examples may bring out what I mean, and I think comparisons on these lines must give us a better understanding of the paths of postglacial immigration and of various problems of floristic phytogeography relating to those countries which are supposed to have been wholly covered by the land-ice and are consequently inhabited by a flora of postglacial origin.

In the following pages I am publishing some results of the examination of my collections, and I hope they may be of interest to British floristic phytogeographers. I know they are very incomplete in many respects, and if they stimulate further studies in this direction, they will have done their duty. Undoubtedly much that is here written will have to be corrected or abandoned.

I have only dealt with some scattered genera, as my friend, Mr. G. C. Druce, has already published a full report on the floristic results,¹ and he is, of course, much more competent to tell what is of interest in the British flora, than I a foreigner. But, at least, these notes may serve as a further proof that the brilliant excursion has had results in the floristic direction.

The sequence in the natural orders is that adopted in the British floras, e.g., Babington's "Manual."

RANUNCULACEÆ.

Ranunculus, Sect. *Batrachium* S. F. Gray. In Denmark and Scandinavia the authors mostly follow the excellent monograph of the species of water-crowfoot, published by my late friend O. Gelert (*Botanisk Tidsskrift*, vol. 19, 1894, Danish with French résumé), according to whom the number of species is rather restricted and each species is very variable. Using this monograph as a standard, I have noticed from our excursion (besides *R. hederaceus* L.), two species, viz., *R. paucistaminens* Tausch var. *Drouetii*

¹ NEW PHYT., Vol. X, pp. 306—328 1911.

(F. Schultz), Marss. from the river at Monsal Dale, Derbyshire, and *R. peltatus* Schrank, f. *truncata* Koch from a small rivulet at the Upper Lake, Killarney.

NYMPHAEACEÆ.

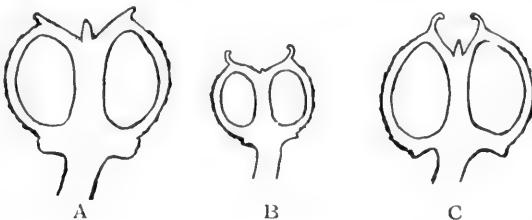
Nymphaea (vel *Castalia*) *alba* L., var. *occidentalis* Ostf., nov. var.

Diffrerit a specie : Nervis loborum folii primaris si in lineam rectam producas, convergentibus; receptaculo ad insertionem subangulato; fructus parte summo cicatricibus staminum destituta; semiibus majoribus (3—3·5 mm.)

Diffrerit a subspecie N. candida Presl. : Granis pollinis verrucoso-papillosis; carpellorum numero majori; radiis disci stigmatici unicuspidiatis flavis; germine sub disco minus angustato; fructu globoso vel depresso-globoso (5 : 7).

Hab. Scotia (Perthshire: Loch Cally prope Dunkeld) et Hibernia (Galway: Craigga More).

The small waterlily found during the excursion, first in Scotland and later in Ireland, was provisionally identified by me as *Nymphaea candida* Presl., and this determination has been followed by Druce in his paper on the "Floristic Results" (l.c. p. 324, New Phytologist), where he quotes the description of *N. candida* Presl. from H. S. Coward, The Waterlilies, (Carnegie Publ., 1905). This description, compiled from different sources, and also the better descriptions in Caspary's different papers, do not wholly



Nearly ripe fruits in longitudinal section. Two-thirds nat. size.

A. *Nymphaea alba* (from Denmark), alcoholic material. B. *N. alba* var. *occidentalis* (from Craigga More, Co. Galway), soaked herbarium material. C. *N. candida* (cultivated in the Botanical Garden, Copenhagen), alcohol material.

agree with our Scottish and Irish specimens. I was, therefore, in some doubt as to the correctness of my identification, and have now examined my specimens more closely and have compared them with numerous specimens of *N. alba* and *N. candida* from Sweden and Eastern Prussia, Bohemia, etc. The result is that the British plant is not the true *N. candida*, to which it has a strong external resemblance. The above given diagnosis will show that it is intermediate between the two forms; having some characters of *N. alba*, others of *N. candida*. Ascherson and Graebner (Fl. Nordostdeutsch. Flachland, 1898–99, pp. 319, 320) also mention, that while the two forms are well distinguished in Prussia, they have often met with forms in Pomerania and Brandenburg: "die sich mehr u. mehr der *N. candida* nähern, ohne ihr jedoch gleich zu kommen, so dass hier eine scharfe Grenze nicht vorhanden ist. Wir haben es hier augenscheinlich mit einer in der Ausbildung begriffenen Art zu thun." I think something like this is the case

with regard to the British form, but I should prefer the explanation that we have, on the Continent, two forms, *N. alba* and *N. candida*, and besides these, in the western part of Europe, our plant, which may also occur in Norway (in our Copenhagen herbarium I have seen a poor specimen which may be referred to it). This form seems to inhabit pools and small lakes in moors, while the true *N. alba* (as we saw it in the Norfolk Broads), prefers less "acid-humus" water. The true *N. candida* is a northern and eastern form; R. Caspary, "Botan. Notiser," 1879, says "per Europam et Asiam borealem et arcticum et in regione montana Germaniae, Austriae et Asiae (Himalaya); our form is the western substitute; the main species *N. alba* occurs in the whole of Europe and Siberia (excluding the Arctic part), and also in Algeria.

I recommend the form here described to closer examination and comparison with the other forms, preferably under cultivation.

It is smaller in all directions than the ordinary *N. alba*; Leaves 9–12 cm. broad, 11–13 long; diameter of the flower 8–9 cm.

CISTACEÆ.

Helianthemum nummularium (L.) Dunal (= *H. chamaecistus* Mill), v. *tomentosum* (S. F. Gray).

W. Grosser (Cistaceæ, in Das Pflanzenreich, 1903), has divided this species into two sub-species, and C. K. Schneider (Handb. d. Laubholzkunde, 8. Lief., 1909) follows him in this regard; while E. Janchen (Die Cistaceen Österreich-Ungarns, in Mitteil d. Naturv. Vereins an der Universität Wien, 1909) has several separate species under the *species collectiva* *H. chamaecistus* Mill.

Whether we follow the first or the latest author, we find two "forms" occurring in the more northern (not alpine) parts of the area of the *species collectiva*. The question then arises which form occurs in the British Isles, or do both forms occur? As far as I have seen, only the var. *tomentosum* (S. F. Gray) is British (while in Denmark we have almost only the other form: var. *hirsutum*, Thuill.), but I have had very few specimens from Great Britain at my disposal, and further examination of more ample material may result in discovering the other form also. The var. *tomentosum* is easily distinguished by the felty, whitish underside of the leaves; var. *hirsutum* has the underside of the leaves green and covered with sparse stellate hairs.

As the two forms do not differ from each other in other more important respects, I find it more natural to follow Grosser and Schneider in taking them as two varieties of one species, than to consider them as two species as Janchen does.

CARYOPHYLLACEÆ.

Sagina procumbens L. × *saginoides* (L.) Dalla Torre. = *S. media* Brügg (Syn. *S. glabra* Druce, 1911, non Fenzl, 1833).

On Ben Lawers we met in plenty a *Sagina* with white petals about as long as the sepals. As there were many specimens and the numerous flowers were open in the sunshine of the forenoon, the plant attracted much attention, and caused much controversy

among the members of the excursion. I suggested that it was a hybrid between *S. procumbens* and *S. saginoides*, both of which were found, but, the latter, at least, only in the fruiting stage. Now when examining more closely the specimens brought home I must insist that my suggestion was quite right, as far as it is possible to identify the hybridity of a plant which is found growing wild and has not been produced by an artificial crossing.

My friend Mr. Druce (I.c. New Phyt., Vol. X, pp. 316 and 325) held that the plant in question must be taken as a variety (var. *scotica* Druce of *S. glabra* Fenzl., a mountain species from the Alps, the Italian mountains, Corsica, Sardinia, etc.). I think, on the other hand, that it is not permissible to refer the Ben Lawers plant to *S. glabra*; the latter has petals one-and-a-half times to twice as long as the sepals (our plant had petals not, or scarcely, exceeding the sepals), while the sepals and often the uppermost parts of the flower-stalks are glandular-hairy (glabrous in our plant); further the South-European plant is more woody and has larger flower-dimensions; and lastly it is quite fertile.

The Ben Lawers plant is practically sterile; when examining numerous specimens I found a few capsules containing seeds, but only very few of the seeds were fully developed, the remainder being small and hardly capable of germination. Mr. Druce's statement that the capsule is "somewhat smaller" shows that in his specimens also the capsules were only partly fertile. The plant stands in all its characters between the two putative parents; it has mostly pentamerous flowers and the petals are as large as those of *S. saginoides*. It has the growth of *S. procumbens*, and this character is of importance, as no doubt the cause of its abundance on Ben Lawers. Small branches of barren shoots are easily broken off from the stem and carried away by the flowing water, and thus the plant is most common along water-courses. It behaves just as hybrids so often do: it is nearly sterile, but propagates profusely by vegetative shoots, and it is more vigorous and the specimens larger than is the case with the parents; further sterile hybrids very often flower much longer than the parents, because they continue to produce new flowers at a time when the parents are fully occupied in ripening their fruits.

The arguments brought forward by Druce are thus shown to be no arguments against the supposition of hybridity.

It is probable that this hybrid will be found to be rather common in places where both the assumed parents grow together, just as I have found that the hybrid *S. procumbens* × *subulata* is rather common on the Færöes, and behaves in the same manner as the Ben Lawers' hybrid does, having large and vigorous specimens, propagation by detached vegetative shoots, and sterility. This last hybrid is distinguishable from the Ben Lawers' glandular plant by the hairs on the sepals and uppermost part of the flower-stalk.

According to my view *S. glabra* Fenzl. must then disappear from the British Flora as suddenly as it has appeared.

GERANIACEÆ.

Geranium Robertianum L. var.

As far as I am able to understand the segregates of *G. Roberti-*

anum which A. Jordan has described (*G. modestrum*, *G. villarsianum*, etc.), the specimens collected in West Ireland on our excursion do not belong to them. Rouy and Foucaud (Fl. de France, vol. 4, 1897, p. 95), admit under *G. Robertianum* (besides some forms of lower rank) only one "forme" (i.e., sub-species), viz., *G. purpureum* Vill., and under this sub-species they have arranged a whole series of Jordan's segregates. I think this arrangement is very good. The true *G. Robertianum* L. has more or less hairy carpels which have rather few and distantly placed transverse ridges (often branching), mostly larger petals and red anthers; its leaves are several times pinnatifid. *G. purpureum* has glabrous carpels with many and densely placed transverse ridges (not branching), smaller petals and yellow anthers; its leaves are not so many times pinnatifid.

According to the description a plant found in Cornwall (see Bot. Exchange Club Rep. for 1910), must belong to *G. purpureum*, but our Irish plants (from Clifden, Co. Galway, and Ballyvaghan, Co. Clare) do not; they have carpels of the true *G. Robertianum*, and must be referred to it. They have not the external habit of the typical *G. Robertianum*, and the flowers are considerably smaller, etc.; it is therefore probable that they represent a special variety, which has to be examined under cultivation and perhaps should have a name, but they must not be identified with *G. Villarsianum* Jord. or *G. purpureum* Vill.

ROSACEÆ.

Alchimilla acutidens, Buser, Lindb. fil. ampl.

The record of this "species" of *Alch. vulgaris* on Ben Lawers (alt. 400 to 800–1000 m.) is rather interesting from a phytogeographical point of view. It is an alpine and northern species which according to H. Lindberg's monograph (Die nordischen *Alchemilla vulgaris*-Formen und ihre Verbreitung, Helsingfors, 1909), is found in Russia, Finland, Sweden (southward to ca. 59° N. Lat.), Norway, the Farœs and Iceland, besides the Alps. It is rather surprising that it was not known from the Scottish mountains before, although Dr. Lindberg had abundant material of *Alchemilla* from the British Isles for examination. Now, that we have found it on Ben Lawers,—and no doubt it will be found elsewhere in the Scottish Highlands,—a gap in its area of distribution has been filled up.

The "species" is very near the common *A. alpestris* Schmidt, from which it differs in the following points:—

The flowering stems sparsely covered with adpressed hairs in the lower part up to the second (or third) branch; the leaf-stalks also bear adpressed hairs, as do the nerves of the leaves on the underside and generally the outermost part of the basal lobes; leaves orbicular or reniform with 9(–11) lobes; teeth uniform, acute; apical tooth as long as and uniform with the others. Apart from the distribution of hairs here described the plant is glabrous (with the exception of the hairs on the tips of the leaf-teeth). *A. alpestris* bears still fewer hairs; only the leaf-nerves of the underside are hairy on their distal halves, and the stems and leaf-stalks are very slightly hairy; the teeth of the leaves are not so uniform nor acute, and apical tooth is smaller than the others.

Sorbus aucuparia L. var. *flava* Druce, New Phyt., 1911, p. 312.

The form with orange-yellow ("aurantiacus") fruits seems not to have been described before, as it is different from *S. aucuparia* var. *Fiscana* hort. (cf. Ascherson and Graebner, Snyopsis VI, 2, 1906, p. 88), which is a yellow-fruited form of the hairy variety (var. *lanuginosa* (Kit.) of the mountain ash. The Irish yellow-fruited form belongs to the var. *typica* of the species. I only saw one tree at Roundstone (Galway), and two trees, far distant from each other, in the wood at the Upper Lake, Killarney.

DIPSACACEÆ.

Succissa præmorsa (Gil.) Aschers., var. *hispidula* Petermann, Fl. Lips. excusor., 1838, p. 119 (cf. Dörfler, Herb. normale, No. 4537).

The strongly hairy specimens of *Succisa* growing in the grass-sward on the coastal cliffs of the Lizard peninsula (Kynance Cove, etc.) may be referred to the above variety.

COMPOSITÆ.

Erigeron borealis (Vierhapper) Simmons. Syn. *E. alpinus* auct. brit.; *Trimorpha borealis* Vierhapper, Beih. Botan. Centralbl., 19, 2. Abt. 1906, p. 447.

According to Vierhapper's monograph of the alpine species of *Erigeron* the Scottish and northern plant usually named *E. alpinus* is not the true alpine species, but another separate species. It differs from *E. alpinus* in the obtuse basal leaves, the rather sparingly hairy base of the stem and the strongly hairy, often purple phyllaries.

Sonchus oleraceus L. var. *albescens* Neuman (Sundsvalls Almäntna Läroverks aarsredögörelse, 1889). cf. Neuman, Sveriges Flora, 1901, p. 57, and Ostenfeld, in Botan. Tidsskrift, vol. 29, 1909, p. 328.

In 1889 L. M. Neuman pointed out that besides the yellow-flowered typical *S. oleraceus* a form with paler flower occurred in Denmark. I myself have seen this form in many places in Denmark and also elsewhere, and during the excursion I found it in Ireland, at Galway City, where the typical form was also present (the latter was noticed again at Cork). I think the variety will be found to occur over the whole of the British Isles.

In Denmark I have cultivated the pale-flowered form and found that it keeps quite constant. The corollas are really white with a grey-lilac stripe on the underside, but as the pollen is orange-yellow, it gives a pale-yellow tint to the whole capitulum, and a closer examination is necessary to discover how the matter really stands.

ERICACEÆ.

Erica Mackayi Hook. \times *tetralix* L.=*E. Praegeri* nov. hybr.

Much has been written about the peculiar *E. Mackayi* Hook. and it has been considered a hybrid, but I think that Macfarlane (Trans. Bot. Soc., Edinburgh, Vol. XIX, 1891, p. 58-64) has fully shown that it is a separate form derived from *E. tetralix*, of which he makes it a sub-species. I think I have found another argument which supports the idea of *E. Mackayi* being a true species and not a hybrid—undoubtedly very near to *E. tetralix* and perhaps to be considered as a mutant of it. This argument is the existence of

what is apparently a hybrid between *Mackayi* and *tetralix*. The leaves of the true *E. tetralix* are hairy (downy) on the upper side quite apart from the long gland-tipped hairs on their edges which make them ciliate. The flower-stalks, the sepals and the upper parts of the stems are also downy or tomentose, and the ovary is densely hairy. All these characteristics are expressions, according to my view, of only one character, *viz.*, hairiness (tomentum); and this character is absent in *E. Mackayi* which has only the glandular hairs (also present in *E. tetralix*). Consequently in *E. Mackayi* the upper sides of the leaves, the sepals and the ovaries, are glabrous, while the flower-stalks and the upper part of the stem are glandular. Besides this character, the two species differ from each other in the shapes of the corolla and of the leaves. Both produce ripe seeds.

When collecting both *E. Mackayi* and *E. tetralix* on Craigga More near Roundstone (Co. Galway), I was struck with some individuals which did not answer well to either of the two species, and now having examined the material brought home, I feel convinced that we have here a hybrid between the two species. As far as I remember it was not rare at the place (I have three collection numbers) and it shows in that respect a parallelism to the fairly abundant occurrence of *E. Watsoni* Benth. (*E. ciliaris* L. \times *tetralix*) at Perranwell, near Truro (Cornwall) with its two parents.

The hybrid from Craigga More stands in its characters between its supposed parents; it has an ovary which is glabrous with the exception of some hairs on the ridges; the leaves are broader than in *E. tetralix*, but much more revolute than in *E. Mackayi*; they are nearly glabrous above, and the tomentum on the upper parts of the stems and on the flower-stalks is not dense as in *E. tetralix*; the outer side of the sepals are only very faintly hairy. I have not succeeded in finding any fully developed ovary containing good seeds; and I suppose the plant to be sterile.

Upon these characters I have based my supposition that the specimens are of hybrid origin and I think it is not possible to determine the question more nearly without making crossing experiments, the only absolutely decisive proof in this matter. I have named it in honour of our excellent guide in Ireland, Mr. R. Lloyd Praeger of Dublin.

GENTIANACEÆ.

Gentiana campestris L.

The sub-sp., *germanica* (Froel.) Murb. (the common British plant I suppose) was found near Dunkeld, Perthshire.

The sub-sp., *baltica* Murb. (pro-specie) was found at Southport (golf-links on the dunes) and at Ballyvaghan, Co. Clare.

Gentiana amarella L.

All the plants seen belong to sub-sp. *axillaris* (Schmidt) Muzb., *viz.*, those from Ireland: Ballyvaghan, Co. Clare; England: Butser Hill, W. Sussex; Kingley Vale, W. Sussex; Haweswater near Silverdale, Lancashire; Southport, golf-links.

SCROPHULARIACEÆ.

Alectoerolophus (Rhinanthus) minor (Ehrh.) Wimm. and Grab.

When studying the segregates of *Alect. minor* in northern

Europe, I have found that hardly any of them deserve to be taken as separate species. Most of them are, at least in the northern and north-western parts of Europe, merely variations caused by external conditions ("Standortsmodifikationen" of the Germans) and not hereditary varieties. One of the few variations of somewhat higher value is var. *Drummond-Hayi* B. White, which we saw on Ben Lawers.

The seasonal variations seem not to be fixed in this genus as far as *A. minor* is concerned; hence I take *A. stenophyllum* only as representing the late flowering individuals of *A. minor* sensu stricto (we saw it at Ballyvaghan, Co. Clare), and *A. monticola* only as the late flowering individuals of a small mountain-inhabiting *A. minor*, of which *A. rusticulus* is the extreme. The name *A. borealis* merely represents larger individuals of *A. minor* var. *Drummond-Hayi*.

Some years ago (Botan. Notiser, 1904) I showed that in Great Britain *A. major* (Ehrb.) Rehhd. has only been found in Sussex, while the other records belong to the separate species *A. aterus* (Fr.) Ostf., easily distinguished by the wholly or nearly wingless seeds. It has two areas of distribution in Great Britain, one with Yorkshire as centre, and another in east Scotland. Its general area of distribution is from Great Britain through Denmark, North Germany, Norway and Sweden, east-ward to Finland. For several years I have cultivated it and found it keeping all its characteristics and remaining quite distinct from the true *A. major*.

Euphrasia. The British Eyebrights are not easy to keep separate from each other, although we have the valuable monograph by the late Mr. F. Townsend (Journ. of Botany, 1897). In order to obtain as much knowledge about them as possible I collected during the excursion a good many specimens (about thirty different numbers), and have now examined them more closely. The result is that, while some species are easily distinguishable, others are very difficult to name when using Townsend's paper and Wettstein's monograph. I think a study of the British Eyebrights on the spot will alter our views with regard to several of Wettstein's species.

As it may be of some use to know the identifications made by a continental botanist, of some British Euphrasias, I shall enumerate the species which I have collected and the localities for each of them.

E. Rostkoviana Hayne. A few individuals of a small-flowered form was found at Clifden, Co. Galway, growing among members of *E. brevipila* and resembling it closely. This is hardly distinguishable from *E. hirtella* Jord.

E. Vigursii Davey. Specimens agreeing with authentic *E. Vigursii*, presented by Dr. C. C. Vigurs, were found in Cornwall: Mullion Heath, near the Lizard.

E. brevipila Burn. & Greml. Seems to be common. Dunkeld, Perthshire; Cressbrook Dale, Derbyshire; Clifden, Co. Galway; Dog's Bay near Roundstone, Co. Galway (low, blue-flowered specimens).

E. stricta Host. Ballyvaghan, Co. Clare; both typical and aberrant forms.

E. nemorosa Pers. Seems to be common in England. Silverdale, Lancashire; Perranwell, Cornwall; Kingley Vale near Chichester, W. Sussex.

E. curta, Fr. A curious, nearly unbranched, dark coloured heather moor plant, with leaves only slightly clothed with stiff hairs,

may be referred to *E. curta*; it was found on Craigga More and Urrisbeg near Roundstone, Co. Galway. Specimens which I have named *E. curta*, var. *glubrescens* Wetst., were taken on the golf-links at Southport and on grassy, chalky ground at Dogs Bay, Co. Galway. Typical *E. curta* was not met with.

E. gracilis Fr. Seems to be common in Scotland and Ireland. Dunkeld and Ben Lawers, Perthshire; Urrisbeg, Co. Galway; Ballyvaghan, Co. Clare.

E. minima Jacq. In a paper on the Flowering Plants of the Færöes (Botany of the Færöes, Vol. III, Copenhagen, 1907), I have (pp. 844-847) published my studies on the small-flowered Euphrasias of the Færöes and Scotland; from the latter country I had ample material at my disposal through the kindness of the late Mr. Townsend and the late Mr. W. H. Beeby. The main result was that the two Scottish species *E. foulensis* Towns. and *E. scotica* Wetst. (*E. paludosa* Towns.) are not distinct from *E. minima* Jacq., a widely distributed alpine species, and that, consequently, both species have to be sunk and *E. minima* recorded as a British plant. Nevertheless we find in the later lists of British plants (e.g., Druce's list of 1908), both the former species maintained, and further, in 1909 *E. minima* was published in Journ. of Botany as a new English plant without any reference to its occurrence in Scotland. As I had drawn my conclusions from examination of dried material, I was very interested in finding "*E. scotica*" growing in Scotland on Ben Lawers, and an examination of it strengthened my belief in the correctness of taking it as a mere synonym of *E. minima*; I am therefore glad to learn from Druce's paper (New Phyt., l.c. p. 317) that "Professor Wetstein confirms Professor Schroeter's determination of '*Euphrasia scotica*' from Ben Lawers as *E. minima*, an opinion independently arrived at by Dr. Ostenfeld." I hope that *E. foulensis* will follow *E. scotica* and disappear also.

E. salisburgensis Funck. Ballyvaghan and Kinwarra, Co. Clare, on limestone. The record from Roundstone, Co. Galway, was not confirmed during the excursion, only small *E. gracilis* being found.

Melampyrum vulgaratum Pers.

The *Melampyrum pratense* collected during the excursion (Yorkshire, Honley Woods; Killarney, Co. Kerry) belong to the above-named form, not to the true *M. pratense* L. sens. stricto.

F. hians Druce seems to be the yellow-flowered form of *M. vulgaratum*, just as *f. aureum* Norman is the yellow-flowered form of the true *M. pratense* L. I do not know if *M. pratense* sens. strict. occurs in the British Isles; it must be looked for in the northern and mountainous parts.

LABIATÆ.

Lamium galeobdolon (L.) Crantz, var. *montanum* (Pers.) Briquet.

In the British Isles *L. galeobdolon* occurs in the same variety: var. *montanum* (Pers.) Briq. (syn. *Galeobdolon luteum* Huds., propter patriam) which is also found in the Alps. In Sweden, Denmark, Germany and the Sudetes and Carpathians another geographical race var. *vulgare* (Pers.) Briquet occurs which seems to have quite a different area of distribution. (Cf. Fl. exsicc. Austro-Hungarica, Nos. 3295 and 3296).

POLYGONACEÆ.

Rumex acetosella L.

The northern form (var. *acetoselloides* Balansa) was found: at Foulshaw Moss near Grange (North Lancashire) and in a sloping grass-field near Greenfield (West Yorkshire), while the plant from near the reservoir of Greenfield was var. *angiocarpus* (Murb.) as were specimens from Perranwell (Cornwall) and Potter Heigham (Norfolk). A plant from the riverside of the Tay at Perth is an *angiocarpus* which verges somewhat into *acetoselloides*.

Rumex obtusifolius L. × *sanguineus* L. (*nemorosus* Schrad.)

This hybrid was also found on the riverbank along the Tay at Perth, as well as in Cressbrook Dale (Derbyshire).

JUNCACEÆ.

Juncus bufonius L. var. *ranarius* (Song. & Perrier).

Druce (l.c. New Phyt., pp. 321 and 327) on the authority of Professor P. Graebner has taken the form growing in the sand-dunes of Southport as a separate species *Juncus ranarius* Song. & Perrier, and he adds that the "monographer of the genus," the late Professor F. Buchenau, held the same view. The latter supposition is hardly correct; in Buchenau's last work, his monograph of the Juncaceæ in Engler's *Das Pflanzenreich* (published 1906) we do not find *J. ranarius* as a species, nor even as a variety. He has a var. *halophilus* Fernald & Buchenau (*Rhodora* VI, 1904, p. 39) of which the diagnosis in *Das Pflanzenreich*, *Juncaceæ* (p. 106) runs as follows: Flores ultimi sæpe approximati. Tepala externa acuta, acutata vel subulato-acutata, fructu fere semper longiora, interna breviora obtusa vel rotundato-obtusa, interdum mucronata, fructum subæquantia; semina trunca (the localities given are Quebec, north-eastern part of U.S., Sicilia and Catania); and under this variety he says: formæ intermediae var. *halophili* et *genuini* haud raro occurunt, præcipue in locis salsis. Pro exemplo: *J. ranarius* Songeon & Perrier: tepala interna fructum subæquantia vel paullo superantia, acuta vel obtusa et semina ovoidea præbet (Ascherson u. Graebner, *Synopsis* II, 2, 1904, p. 423 [spec.]). From this we must draw the conclusion that the best authority on Juncaceæ, Professor Buchenau, did not consider the salt-marsh and sea-coast form of *J. bufonius* as a separate species. And I think he was quite right in his view; the differences between the typical *J. bufonius* and the *J. ranarius* are only very minute, and it is easy to find specimens in which some characters are of *ranarius* and others of *bufonius* proper. I do not doubt that it will be possible to keep the form true by breeding, but this argument does not satisfy me, as I am sure that in *Junc. bufonius*, as in most of the common and widely distributed species, there are numerous "elementary species" which will all keep true when cultivated. In the present stage of our knowledge we must not use the elementary species as species in the floristic and phytogeographic sense; we are forced to use higher units as species and to treat elementary species as varieties or perhaps even sub-varieties. We can no more give specific rank to the saline form of *J. bufonius* than we can make a separate species of a glabrate form of an ordinarily hairy species (e.g., *Melandrium album*). The highest value we can give to this form

from the systematic standpoint is that of a variety—var. *ranarius* or var. *halophilus*.

CYPERACEÆ.

Scirpus cæspitosus, L.

In 1897 E. Palla (Ber. Deutsch. Bot. Ges., Vol. 15, pp. 467-471) pointed out that *Scirpus cæspitosus* (his *Trichophorum cæspitosum*) was not a homogeneous species, but consists of two distinct forms, which he considers as two species, viz., *Trichophorum austriacum* Palla and *T. germanicum* Palla. The more important distinctive marks are anatomical, but external differences also exist. The author further showed that the two forms inhabit quite different geographical areas, *T. austriacum* being a northern and alpine species found in Greenland, North America, the Himalaya, Northern Europe and the central European mountains, while *T. germanicum* was confined to the North German plain, the German "Mittelgebirge," the French plain, Scotland and the South-Scandinavian plain.

In 1903 Ascherson and Graebner (Synopsis d. mitteleurop. Flora II, 2 p. 300) united Palla's two species under *S. cæspitosus* as two "Rassen" (races or varieties); and I think this is the natural way to treat them. I give the following external characters of the two varieties mainly from their description.

S. cæspitosus L. var. *germanicus* (Palla) Aschs. and Graebn. A rather slender form. The mouth of the uppermost sheath opposite the blade rather deeply cut (up to more than 3 mm.), with rather broad, mostly red-coloured and loosely appressed membranous margins. Spikes rather large, many flowered. Bristles of the perigonium papillose at the top. The older sheaths covering the bases of the shoots hardly shining, pale-brownish, often dark from decaying matter.

S. cæspitosus L. var. *austriacus* (Palla) Aschs. and Graebn. A coarser form. The mouth of the uppermost sheath not deeply cut (mostly not more than 1 mm.), with narrow, whitish or pale-brownish, closely appressed membranous margin. Spikes rather small, few-flowered. Bristles of the perigonium mostly not papillose at the top. The older sheaths larger and more loosely arranged, bright pale-brown, shining.

With regard to their geographical distribution the authors have not much to add to that already given by Palla; they quote only var. *germanicus* from the British Isles.

As it seemed to me to be of interest to know a little more about the distribution of these two varieties in the British Isles I collected during the excursion specimens in four different parts of the British Isles. The result of an external examination was:—

Var. *germanicus*. Ireland, Co. Galway, Craigga More; England Hampshire, New Forest. To these may be added: Hebrides Stornoway (O. Paulsen, 1905), specimens in our Herbarium in Copenhagen.

Var. *austriacus*. England, North Lancashire, Meachop Moss near Grange; Scotland, Perthshire, Ben Lawers (a form somewhat approaching to var. *germanicus*).

These few localities seem to suggest a rather interesting distribution within the British Isles, but much more abundant material

is necessary in order to come to a decision upon that point. I should like to suggest to British botanists an examination of the material in the large British herbaria (anatomical examination would also be required) in order that the distribution may be better known. Provisionally I should think that var. *austriacus* is confined to the moors (mostly *Eriophorum*-moors) of north England and Scotland, while var. *germanicus* is the common form of the British Isles, at least in the southern and western parts.

In Denmark we have both varieties, but var. *austriacus* is rather rare and occurs almost only in deep *Sphagnum*-moors, while the common form, var. *germanicus*, often grows in drier localities (heaths, etc.)

As to their general distribution I have seen specimens of var. *austriacus* from North America, Greenland, Iceland, Scotland and North England, Scandinavia, Denmark, Russia, East-Prussia, Silesia, Bavaria, and the other mountainous central-European countries, and of var. *germanicus* from the German plain, the French plain, Denmark, West-Norway (?), England and Ireland, the Hebrides and Færöes (where also specimens occur which approach the other variety). Thus the latter has a much more restricted geographical area than the former.

I have omitted to mention the anatomical distinctions as I have not had time to examine my material in that direction, and may refer to Palla's paper quoted above.

GRAMINEÆ.

Arundo phragmites L.

During our visit to the Norfolk Broads the giant form of *Arundo phragmites* growing especially in Surlingham Broad attracted our attention; the leaves of the flowering stems were about 4 cm. broad. As far as I am able to find out by examination of my material this form comes very near to the southern race of *Arundo*: *A. isiaca* Del. (*Phragmites gigantea* Gay, *P. altissima* Mabille) which is common in the Mediterranean region; but the latter has mostly brownish, not dark-violet, spikelets. Ascherson and Graebner (Synopsis II, 1, p. 330) mention a var. *pseudodonax* Rabenh., of which I have not seen specimens, but which, according to the description, answers fairly well to the Norfolk form. It would be interesting to learn, if we really have a special (southern ?) form here, or only giant specimens of the common plant, caused by the favourable conditions of growth.

Poa trivialis L. var. *subalpina* Beck (Fl. N. Oesterreich, 1890, p. 86).

Along old watercourses on Crossfell (Cumberland) and, as far as I remember, also on Ben Lawers (Perthshire) we found an interesting small form of *P. trivialis* growing among mosses. The panicle is tinged with violet and rather small; the stolons are not, as ordinarily, borne above the surface, but are buried in the mosses.

I think it may be identified with the above quoted var. *subalpina* Beck, which has the following description: blade of the uppermost stem-leaves very short, not reaching the panicle; spikelets more or less violet-tinged; grows in springy ("quelligen") places (1200 m. alt.)

Triticum litorale Host. (=*Agropyrum pungens* auctt., non *T. pungens* Pers.)

Duval-Jouve has shown that *T. pungens* Pers. is the hybrid between *T. junceum* and *T. repens*, and therefore the British plant, usually named *Agropyrum pungens* R. and S. must bear the name *T. litorale* Host. It is a very characteristic species growing on rather old beaches where the soil is not bare sand, but somewhat clayey. I have never seen it on the Danish coasts and I doubt if it reaches as far north; with us it is replaced by saline forms of *T. repens* L. (*T. litoreum* Schum., etc.) and the polymorphous hybrid *T. junceum* × *repens*.

We saw *T. litorale* in great quantities at Blakeney Point (Norfolk) and at different places near Portsmouth (Hayling Isl.) and along Southampton Waters. At Blakeney Point and Calshot (Southampton Water) the hybrid *T. junceum* × *litorale* was also present, and at the first place perhaps also the hybrid *T. litorale* × *repens*.

POTAMOGETONACÆ.

Potamogeton perfoliatus, var. *lanceolatus* Blytt.

Perthshire, Loch of the Lows and Butterston Loch near Dunkeld.

The form found in these two Scottish lochs answers well to the var. *lanceolatus* Blytt, described from Norway.

POLYPODIACEÆ.

Polystichum lobatum (Sw) var. *Plukenetic* (Lois.)

Ireland, Ballyvaghan (Glen Thna Mountain), limestone.

The well known authority on Ferns, Mr. Christensen of Copenhagen, has determined a curious form of *P. lobatum*, which superficially resembles *P. lonchitis* Roth, as given above; it is the same as Mr. Druce (l.c. New Phyt., Vol. X, p. 323) names *P. aculeatum* Roth var. *lonchitoides* Deakin.

The same authority considers the dubious form of *Asplenium* from Kynance Cove, the Lizard, referred to in Druce's list as true *Asplenium adiantum nigrum* L.

SALVINIACEÆ.

Azolla filiculoides Lam., with ripe microsporangia.

The *Azolla* growing in abundance and fruiting in a little pond near a garden at Woodbastwick, E. Norfolk, is *A. filiculoides* Lam., not *A. caroliniana* Willd. as stated in Druce's notes (New Phyt., Vol. X, p. 324).¹

A. filiculoides is a species of American origin (mostly South-American) and it was introduced to Europe a long time ago; it is now quite naturalized in West France (Cherbourg, Bordeaux, etc.)

From *A. caroliniana* it differs in the more racemose branching of the fronds (not repeatedly pseudo-dichotomous) and the unicellular hairs on the upper surface of the upper leaves, as well as in microscopical characters which furnish a better distinction.

¹ As I did not collect the plant we saw in a pond near Queenstown Junction, Cork, I do not know if it is *A. caroliniana* or *A. filiculoides*.

VII.—PFLANZENGEOGRAPHISCHE EINDRÜCKE AUF DEN BRITISCHEN
INSELN.

von P. GRAEBNER

(Gross-Lichterfelde, Berlin).

DER HAUPEINDRUCK, den der aus Mitteleuropa in die einzelnen Teile der Britischen Inseln kommende Pflanzengeograph gewinnt, ist der, dass er in ein uralter Culturland kommt, in dem namentlich durch die ausgedehnte Viehzucht, in erster Linie durch die Schafe, die natürliche Vegetation auf dem grössten Teile der Fläche so verändert ist, dass es schwer ist, aus den jetzt dort vorhandenen Pflanzen sich ein Bild zu machen von den natürlichen Formationen, die dort geherrscht haben, bevor der Mensch das Land seiner Cultur unterwarf. Das typischste Beispiel welches uns auf der von Tansley so trefflich geleiteten Reise der Internationalen Phytogeographen deren floristische Ergebnisse der Altmeister der Britischen Floristik, Claridge Druce, vor kurzem in gewohnter Sachkenntniss in diesem Blatte dargestellt hat, entgegentrat, war die Vegetation des Cross-Fell. Niemals sah ich irgendwo in Mitteleuropa Vegetationsformationen die derartig artenarm sind, wie verschiedene Flächen an den Abhängen und auf dem Gipfel eines solchen Berges. Natürlich ist daran nicht allein die Viehzucht Schuld, sondern die Eigenart des Klimas spielt eine grosse Rolle. Vergleicht man damit unsere doch im Wesentlichen unter gleichen Verhältnissen lebenden alpinen Weiden, so fällt den Unterschied besonders in die Augen. Auf einem Abhang gegen der Gipfel des Cross-Fell gelang es Dr. Rübel und mir z.B. trotz eifrigen Suchens keine andere grössere Pflanze zu finden als *Festuca ovina*, *Carex verna*, *Thymus serpyllum*, *Cerastium triviale*, *Cirsium lanceolatum*, *Galium Harcynicum* (*G. saxatile*) und dazwischen *Polytrichum*. Auf dem Gipfel wurde an einer grösseren Fläche in etwa 800m. in einem im Wesentlichen durch *Nardus stricta* und *Juncus squarrosus* gebildeten Bestande notiert: *Vaccinium myrtillus* (viel), *Cladonia rangiferina* (viel), *Potentilla silvestris* (*P. tormentilla*) und *Galium Harcynicum*. Nichts weiter!

Je schroffer die Felsen aufstreiben, je mehr das Profil des

betreffenden Berges oder Abhanges steile Felsen zeigt, desto öfter finden sich Plätze an denen seltener, an bestimmte physikalische verhältnisse gebundene Pflanzen vorkommen. Ben Lawers liegt allerdings in einer pflanzengeographisch anderen Zone als Cross-Fell, die interessanteren nordischen Elemente zeichnen ihn schon aus, aber auch wenn man die Zahl der verbreiteten Arten, besonders der Gebirgspflanzen, vergleicht, fällt ihre sehr viel grössere Zahl auf. Die Ursache möchte ich in dem Vorhandensein der in das Gestein eingesägten Rinnale süchen, die für die Schafe etc. schwer resp. unbequem zugängliche Stellen schaffen, so dass ihre Vegetation nicht so oft von ihnen belästigt wird, resp. hier und da ganz ungestört bleibt. Stellenweise finden sich auch hier ähnlich artenarme Flächen wie auf Cross-Fell, besonders die durch *Juncus squarrosus* hauptsächlich besiedelten Flächen bieten wenig Interesse, sehr viel mehr schon die schönen Weiden der *Alchimilla alpina* und je mehr man sich dem Gipfel nähert, desto mehr mehrt sich die Zahl der interessanten Gewächse; eine Perle ist die Einbruchstelle am Gipfel selbst, in die zum Teil in geringer Zahl sich einige Seltenheiten, die uns Professor Bayley Balfour in liebenswürdigste Weise zeigte, geflüchtet haben. Manche sonst seltene oder doch spärlich wachsende Arten werden dadurch, dass sie von den Vieh verschmäht werden, auffällig häufig, so z.B. *Lycopodium selago* und andere. Die characteristische "Schneethälchen"-Bildung der Alpen wurde von unseren Schweizerischen Reisegenossen mehrfach in schöner Ausbildung constatiert.

Der untere Teil der Berge war sicher früher bewaldet, namentlich die an den von uns besuchten Hügeln characteristiche dunkle Zone des Bestandes von *Pteridium aquilinum* war wohl die Region des Hochwaldes. Von unseren Mitteleuropäischen Halb-Culturformationen, einschliesslich der künstlichen Wälder etc., wissen wir, wie zähe die Waldpflanzen auch nach Vernichtung oder Umwandlung des Waldes sich oft erhalten. Auch die Englisch-Schottischen Berge geben davon Zeugniss; z.B. am Ben Lawers wächst an den schattigen Felsen viel *Luzula sylvatica* (*L. maxima*) mit anderen charakteristischen Bewohnern der Bergwälder.

Auch die Vegetation der Wälder, sowohl der Bestand des Waldes als die Beimischungen der Unterholzes und der Krautflora erscheinen en den meisten Teilen verändert. Auch hier ist in den meisten Fällen die directe Einwirkung der Viehzucht etc. sichtbar, dann aber auch Einbürgerung alter Culturpflanzen; so macht *Acer pseudoplatanus* so vollständig den Eindruck einer einheimischen Art,

dass man ihn ohne Kenntniss der Floengeschichte des Landes dafür halten würde.

Unberührtes Hochmoor sahen wir in keinem Falle; alle zeigten sie starke Veränderungen, meist Entwässerung und Verheidung; unsere phytogeologischen Collegen werden die Veränderung der Flora am besten constatieren können. Sehr viele der oft dicken Moosmoore trugen genau dasselbe Vegetationsbild wie ich es auf den sekundär veränderten Mooren des nördlichen und besonders des nordwestdeutschen Flachlandes zu sehen gewohnt bin. Nirgend mehr sah ich eine zusammenhängende *Sphagnum*-Decke. An den ja auch in Deutschland nur noch sehr spärlichen unberührten oder doch in grösseren Teilen unberührten Mooren sind doch wenigstens an den Senken und Rüllen solche *Sphagnum*-Flächen mit nur sehr zerstreut eingemischter Vegetation phanerogamer Gewächse zu finden. In England überwiegen die letzteren fast überall. Das oft massenhafte Auftreten der Heidesträucher *Myrica gale* etc., ebenso wie der Strauchformen der *Betula pubescens* und mancher Rasen oder Bütten bildender Kräuter, wie z.B. der *Molinia caerulea* sind typische Anzeichen der künstlichen Veränderung. Auf eine solche möchte ich auch das jetzige Aussehen der hochinteressanten und merkwürdigen Moorformation zurückführen, wie sie sich im nördlichen England findet, und wie sie uns in Gestalt des "Featherbed" und "Hassock" Moss unweit Huddersfield ein so interessanter Ausbildung gezeigt wurde. Von etwa ähnlichen auf der Höhe des Gebirges gebildeten Hochmooren, wie wir sie in Mitteleuropa öfter z.B. auf den "Brockenfeldern" im Harz finden, ist diese Formation durch den fast gänzlichen Mangel an Strauchvegetation verschieden. *Eriophorum vaginatum* ist vorwiegend; die Hänge, besonders die nach N.W., sind oft mit dichten Bestände des *Rubus chamænoros* überzogen. An den oben entwässerten Stellen tritt *Eriophorum* oft zurück und an den trockneren Stellen findet sich *Calluna*, an den feuchten *Juncus effusus*, also ein typisches Niederungselement, an. Unterhalb an den Hängen ist stellenweise viel *Betula* und stellenweise kilometerweit *Pteridium aquilinum*. Bei der grossen hier herrschenden Niederschlagsmenge, ca. 125 cm. jährlich, müsste hier eine ganz andere echte Hochmoorvegetation herrschen. Anscheinend durch Nutzung (Schaftrieb!) ist die für solche Flächen in Mitteleuropa so charakteristische Strauchvegetation verschwunden oder doch zurückgedrängt. Die Folge der damit verbundenen Veränderung der Moosvegetation, etc. ist der geringe Zusammenhalt der Mooroberfläche. Bei starker Wasseraufnahme

des Moores wird die Gefahr des seitlichen Aufreissens, des Moorbruches, ständig vorliegen. Solche Risse in den Seiten des Moores, die später natürlich ähnlich wirken wie künstliche Entwässerungsgräben, die dem Abfluss des überschüssigen Wassers dienen, werden dadurch zu echten Erosionsfurchen, wie sie gerade die genannten Moore der Hochfläche in grosser Zahl zeigten und wie man sie (in sehr viel kleinerem Maasstabe) auch bei uns in veränderten Gebirgsmooren findet. Dass auf die durch den Moorbruch und die Erosion kahlgelegten Torfflächen in trocknen Zeiten auch der Wind erheblich wirken muss, liegt auf der Hand.

Die Folge eines typischen Moorbruches sind meiner Meinung nach die grossen Denudationsflächen die uns durch Dr. Lewis im Kessel am Cross Fell gezeigt wurden. Die gesammte frühere Vegetationsdecke dieses den Grund des Kessels früher füllenden Moores war von seinen Rändern tief abgesunken. Das völlige Zerreissen der ganzen Oberfläche in Stücke dürfte auch durch Beweidung und der dadurch bewirkten geringen Haltbarkeit der Pflanzendecke bewirkt sein. Es scheint als ob das Moor bei Feuchtigkeitsperioden sich noch in Bewegung befindet.

Dass die Heide, besonders ihre hauptsächlichste Charakterpflanze *Calluna*, in dem feuchten Klima der Britischen Inseln in Bezug auf ihre Standorte nicht wählischer sein würde als bei uns im Nordwesten, was vorauszusetzen. Thatsächlich trafen wir denn auch mehrfach *Calluna* auf Kalk besonders im westlichen Irland, z.B. bei Killarney, und besonders zahlreich und schön in Glenainagh bei Ballyvaghan. Dort zählten Dr. Ostenfeld und ich über 100 Arten, eine bunte Pflanzengesellschaft. Allerdings waren auch hier die durch den Weidebetrieb eingewanderten Arten nicht selten, aber die Steilheit der Abhänge ermöglicht doch ein einigermassen klares Bild der ursprünglichen Vegetation. Ein interessantes Gemisch der Vertreter verschiedener Vegetationsformationen fand sich. Ähnlich wie auch bei uns mischten sich zu der Kalkheide typische Vertreter der Wiesenvegetation wie auch solche der sonnigen Hügel und der Waldvegetation. *Ilex* und *Fraxinus* z.B. wuchsen dort einträchtiglich mit *Gentiana amarella*, *Bellis perennis*, *Plantago lanceolata*, *Dryas*, *Sesleria cœrulea*, *Kæleria cristata*, *Carex pulicaris*, *Hypericum pulchrum*, *Arctostaphylos*, *Ulex*, etc. Wie auch bei uns konnte man leicht nachweisen dass die Wurzeln der *Calluna*, wie auch der übrigen Heidepflanzen, unter der oft dünnen Humusdecke direkt auf den Kalk auflagen, resp. an ihm hafteten. Selbst der von Kalkresten durchsetzte untere Teil des Heidehumus brauste bei Zusatz von Salzsäure auf,

Das massenhafte Vorkommen von *Eriocaulon* in den Seen des westlichen Irland weist auf eine bisher nicht genügend geklärte pflanzengeographische Eigenart der Britischen Inseln hin. Der vortreffliche Forscher der Englischen Wasser- und Sumpfpflanzen, A. Bennett, hat nachgewiesen, dass England mehrere den Nordamerikanischen zum mindesten sehr nahestehende *Potamogeton*-Arten besitzt. Die berühmte *Spartina*-Formation in Süd-England passt trefflich in diesen Rahmen. In Mitteleuropa sind solche Anklänge an die Amerikanische Flora, soweit sie nicht nur durch den Menschen veranlasst wurden, recht selten. Vielleicht gehört in diesen Rahmen das ganz isolierte Vorkommen von *Kalmia angustifolia* in einem Moore bei Hannover.

Ganz besonders imponierend für den Bewohner der trockneren Mitteleuropa ist die typisch Atlantische Vegetation des westlichen England und namentlich des westlichen Irland. Während wir in Deutschland in den Gebirgen höchstens in den feuchten Schluchten der regenreicheren Hänge etwas wie eine echte Epiphytenflora finden, kommt in Norddeutschland höchstens einmal hie und da spärlich *Polypodium vulgare* auf den unverletzten Aesten alter Eichen in den Dünentälern der Ostsee vor, und auch diese anspruchslose Pflanze meist in recht kümmerlicher Entwicklung. Dass die Zahl der oft in Astlöchern etc. wachsenden "Überpflanzen" sehr gross auch in Deutschland ist, ist bekannt, aber diese mit ihren Wurzeln in dem geschützten Inneren des hohlen Stammes steckenden Pflanzen hängen eben nicht von den kleineren Perioden des Klimas ab wie die echten Epiphyten, deren üppige Entwicklung bei Killarney fast an tropische Verhältnisse erinnert. Die dicken Moospolster, besonders von *Hypnum cupressiforme* u.a., die die Eichen und auch Eschen bis fast auf den Gipfel bedecken, geben den Farnen und auch anderen Pflanzen beste Gelegenheit zum üppigen Gedeihen.

Auch die übrigen Pflanzen, die die dort dauernd herrschende feuchte Luft lieben, zeigen eine zum Teil ungeahnte Entwicklung. In den üppigen Wäldern, in die sich z.B. die mediterrane *Arbutus unedo* in Pracht-Exemplaren einmischt, sind oft mehrere Etagen von Unterholz übereinander ausgebildet, eine Erscheinung, wie sie sich eben nur in solchen Klimaten findet. Professor Lindman machte mehrmals auf die veränderte Tracht des *Pteridium aquilinum* aufmerksam, welches nicht, wie bei uns auf dem starren Stiel stehende Blätter besitzt; sondern nach Art tropischer Farne mit seinem verlängerten Mittelstreif und dem

starr abstehenden Fiedern klettert es als "Spreizklimmer" in die Höhe der Sträucher. *Ilex aquifolium* sehen wir bis zum Umfange von 1·05m., *Arbutus* bis 1·8m. in 1m. Höhe, *Calluna* hatte im lichten Walde eine Höhe von mindestens 1·2m., einige bis 1·8m. und noch mehr; eines desselben, mit dem Professor Massart mich photographierte, hatte die stattliche Höhe von 2·2m.! Auch *Blechnum spicant* war bis 7 dm. hoch. Dies seien einige der characteristischsten Beispiele der Aufzeichnungen von besonderer Üppigkeit in jenem Klima, welches den zierlichen *Hymenophyllum* das üppige Gedeihen gestattet. Dass auch die Pflanzen anderer Vegetationsformationen hier ungeheure Grössen erreichen beweist die beobachtete Höhe von *Schænus* von 1·15m. Cornwall besonders der Lizard schliessen sich dem ebenbürtig an.

Aber nicht nur die grosse Üppigkeit der Vegetation des warmen Westens bietet dem Pflanzengeographen grosses Interesse, die grossen pflanzengeographischen Contraste geben manches Rätsel und manche Aufklärung. Rätsel, soweit es schwer ist für ihr Vorhandensein eine stichhaltige Erklärung zu geben, Aufklärung, als manche scheinbaren Widersprüche aus postglacialen Funden, etc., durch sie verständlich werden. Das feuchte Klima scheint in vielen Fällen pflanzengeographische Contraste völlig auszugleichen. Schon das Vorkommen des xerophytischen *Sedum anglicum* in einem Rasen der Repräsentanten der hygrophilsten Vegetation *Hymenophyllum peltatum*, welches Frau Praeger bei Killarney fand, findet wohl kaum ein Analogon bei uns.

Das auffälligste ist aber doch das Vorkommen der *Dryas octopetala* mit den zahlreichen Vertretern der südlich-atlantischen Flora in westlichen Irland, und namentlich ihre Berührung an denselben Standorten bei Ballyvaghan mit *Adiantum capillus-Veneris*. Da selbstverständlich in unmittelbarer Nähe dieser Standorte, am Fusse der betreffender Hügel auch unsere Waldbäume und ihre Begleiter wachsen, so können und müssen noch heute solche von den norddeutschen so völlig verschiedener Ablagerungen des "Dryas-Horizontes" mit ihrer Beimischungen zustande kommen, wie sie von den Britischen Inseln beschrieben wurden. Das Klima muss schon in jener Zeit wesentlich von den norddeutschen verschieden gewesen sein. Auch ganz anderen Pflanzengenossenschaften vermag sich *Dryas* dort anzupassen, so fanden wir es auch in Gesellschaft der *Plantago maritima*.

Ein weiteres sehr auffälliges Moment, welches unseren dortigen botanischen Freunden die Frage nach dem Indigenat

vieler Pflanzen sehr erschweren muss, ist die Leichtigkeit mit der viele Pflanzen verwildert und eingebürgert sind. *Acer pseudoplatanus* wurde schon vorher erwähnt. *Cotoneaster microphylla* und auch *Symonsii* sieht man vielfach an Mauern und Eisenbahn-dämmen gleich einer heimischen Art. *Escallonia macrantha* sieht man in West-Irland oft weit von aller Cultur. *Mesembrianthemum acinaciforme* hängt in langen Polstern an den Felsen von Lizard Point. *Rhododendron ponticum* ist an vielen Orten des Vereinigten Königreichs zur völlig heimischen Pflanze geworden: bei Killarney, etc., macht die Art der indigenen Vegetation erfolgreiche Concurrenz und verändert die Physiognomie der Wälder völlig. Bei Cally unweit Dunkeld mischt sich das capensische *Aponogeton distachyum* in grosser Menge mit den heimischen Wasserpflanzen. Das imposanteste Beispiel beginnender Einbürgerung waren aber die zahlreichen jungen Pflanzen der *Dicksonia antarctica*, die als Sämlinge der von Mr. P. N. Williams in seinen herrlichen und hoch-interessanten Park gepflanzten Baumfarne aufgegangen waren. Letztere waren zu so prachtvoller Entwicklung gediehen, dass ihre natürlichen Standorte auf der südlichen Halbkugel kaum schöner sein können. Sehr bemerkenswert ist auch die massenhafte Verbreitung der *Fuchsia Riccartoni* besonders bei Clifden (West-Irland) die als Bastard nie eine Frucht bringt, und doch kilometerweit die Wege begleitet, sich mit *Dabeocia*, *Ulex Gallii*, und den atlantischen Ericaceen mischt. Auch *Montbretia crocosmiiflora* die wir mehrfach zahlreich trafen, vermehrt sich wohl in Wesentlicher vegetativ.

VIII—SOME IMPRESSIONS AND REFLECTIONS.

BY F. E. CLEMENTS (Minneapolis).

AS one of those deeply interested in the structure and development of vegetation, I shall leave to other members of the party the difficult but pleasant task of doing justice to scenic Britain and to British hospitality. I shall confine myself to sketching the kaleidoscopic impressions of British vegetation, with an occasional reference to the interpretations arising out of comparisons with American vegetation.

The three days spent in the Norfolk "Broads" revealed the general features of a fascinating succession with an unusual number of structural and developmental problems. The striking alternation of *Scirpus*, *Typha*, *Phragmites* and *Cladium* affords unique opportunity for the study of their habitat equivalences and re-actions. It would be difficult, if not impossible, to find a region quite so favourable for such work, owing to the labyrinthine nature of the "Broads," beside which the fabled labyrinths of Crete seem mythical indeed. In the case of the submerged and floating populations, the light and aeration factors furnish an almost untouched field, while on the other side, historically, of the reed-swamp plexus, stretch the problems of its conversion into fen and carr. The ecotone between swamp and fen is an unusually broad one, with corresponding possibilities for studying the change of dominance in relation to habitat factors.

At Blakeney, the vegetational interest centred in the sharp contrast between the salt marshes and the shingle beach, which both makes the marshes possible and then overwhelms them. As a dynamic center, the shingle bank is rivalled only by the sand dunes, though it seems to differ in being rather more periodic than continuous in growth. The production of new habitats for colonization rarely occurs in such a rapid manner, while the periodic development of lateral banks would seem to furnish a unique basis for the study of the sequence of different populations, both on shingle and in the marsh. The quantitative study so characteristic of British ecology, finds perhaps its best exemplification at Blakeney, where also the refinements of exact methods can be carried further than in more complex regions.

English woodlands are an intricate puzzle to the American

ecologist familiar with little else than natural forests, rarely changed except through fire or the hands of lumbermen. The control by man has been so long and continuous and the effect of grazing and of rodents so significant that one is inclined to suspect all comparisons with the virgin forest formations of America. The very fact that continuous stretches are rare further complicates the task. Naturally one finds many phenomena which he would interpret in terms of native vegetation, but this is gratuitous until further quantitative study has been made of the respective ages of different woody populations, the relative dominance of woodland, scrub and grassland, and the actual inter-relations between vegetation and habitat.

The problem of the moor, with its scientific, economic and practical aspects, appeals to the visitor as the outstanding problem of British vegetation. The divergent opinions among European botanists as to the nature of moor and its variations, of its relation on the one hand to swamp and fen, and on the other to heath, constitute a situation in which the American, unfamiliar with these formations, finds it impossible to discover definite landmarks. He realizes, however, that there is here an almost unparalleled opportunity for recording the movements from year to year, in addition to securing fundamental evidence by the methods of experimental vegetation. To one impressed with the complex relations between moor and heath, "Hochmoor" "Flachmoor" and fen, it seems that an exact study of all the factors and population changes for a long period will be necessary for a solution. The importance of doing this is greatly emphasized by the widespread opportunities for tracing the vegetation movements of the past in the almost innumerable peat sections. These serve as an invaluable link between the successions of to-day, and of the immediate geological past. It seems beyond question that their thorough study will reveal much of the development and structure of vegetation long since disappeared. British botany contains no more alluring field than this of correlating the peat deposits and connecting their successions with those in existence at present.

It is, perhaps, not altogether idle to speculate in regard to the reclamation of the moors. Their wide extent and almost complete lack of use, mark them as an asset of great economic importance, and one must be allowed to indulge the hope that the British Vegetation Committee will soon take steps towards the conquest

of the moor practically, as well as ecologically. One must believe that research is of value only as it broadens and deepens the current of human progress, and that no one should be so well qualified to apply the results of investigation as the man who obtained them.

To one sceptical as to the influence of lime, the results of the Excursion were most interesting. One could not fail to be impressed with the abundant evidences of the distributional significance of lime, while he was struck by the fact that scarcely a single "calciphilous" or "calciphobous" plant could prove a clear title to the term, physiologically. It is useless to add a single line to the literary solution of this hoary problem, but the British experience serves to emphasize the conviction that nothing but physiological and competition studies in the field can hope to lead us to a final solution.

Without doubt, the greatest personal return from the Excursion was the first-hand insight into the point of view of ecologists from different countries, and the chance thus afforded of scrutinizing one's own concepts in the light obtained. This must be more and more the real value to be derived from such experiences, if they are to give more than individual benefits, as they will. Botanists, like all scientists, are still so highly individualized that they have little sympathy or patience with anything which looks toward definite and effective co-operation. This would seem to be merely an intermediate stage, and we can hope for the time when the ecologists of many countries will work together with something of the unity and efficiency which characterize the British Vegetation Committee.

IX.—THE FLORA OF GREAT BRITAIN COMPARED

WITH THAT OF CENTRAL EUROPE.

BY OSCAR DRUDE

(Dresden).

TRANSLATED BY A. G. TANSLEY.

AFTER a long botanical journey through a region which, in spite of its strong floristic affinity with Central Europe, is nevertheless full of a peculiar character of its own, the comparative phytogeographer is glad of the opportunity of defining his most important impressions. And this, not only because they are new to him personally, but because, however much he may have studied the literature beforehand, the impressions so obtained can never possess the same sharpness as those gained directly from nature. Perhaps, also, it will not be without interest to English floristic botanists and ecologists to learn what a German botanist has seen in their country so richly adorned with a flora of the most varied charm, and what has appeared to him different from the arrangement of the closely allied plant-formations which occur in Germany. And apart from any value which such a summary—necessarily condensed and aphoristic—may possess in itself, I undertake it the more gladly in the hope that I may in this way repay a small part of the common debt of gratitude which we foreign botanists owe to our English guides, by whom we were so kindly invited and so ably led. Space does not permit me to deal more fully with this debt of gratitude as I personally feel it, but it is a special pleasure that these brief remarks should appear in Tansley's journal, and that they should be based on his *Types of British Vegetation* and on Claridge Druce's *List of British Plants*, since these two works provided the literary basis for the observations and notes made in the course of the five weeks' tour. Just as Tansley and other members of the British Vegetation Committee, to all of whom I should like here to express my thanks, led the whole expedition over hills and valleys, through swamps and moors, from coast to coast, finishing with the ancient beeches and yews of southern Hampshire, so Druce was, as it were, a living herbarium of the flora of Great Britain, untiringly furnishing us at all times with the (not always simple) definitions of species.

SPECIES LIMITS AND LOCAL RACES.

This last task is both difficult and important. It constantly leads us into fresh paths, and in more recent times appears to have become more confused rather than clearer, since the views held in different countries and by different authors as to the extent of the limits of single species differ from one another more widely than was formerly the case. The confusion has been greatly added to by preposterous changes in nomenclature, which pursue their course in the vain hope of attaining a goal that will satisfy everyone. At the same time the complexity of the subject has naturally been increased by new phylogenetic and ecological studies. Thus it is evident that a book like H. C. Watson's *Topographical Botany*, at one time authoritative, is no longer a safe guide, even in fundamentals, and that Druce's "List" with its additions of sub-species and varieties is indispensable. In the variability of species we are confronted by old questions in a new form, especially such questions as whether variations of the same character over wide areas really belong together, or whether they are not rather made up of similar ecological variants of independent local origin, analogues to one another in various separated parts of the whole area, and thus have not the status of a single monophyletic race or sub-species.

Let me cite a single instance. The question arose as to whether a form of *Salsola Kali* occurring on the Southport dunes was to be considered as *S. Tragus*. Druce's list does not consider this form as indigenous. It is interesting to recall the doubt which such critical observers as Mertens and Koch¹ felt a hundred years ago on this "species" established by Marschall von Bieberstein, and how they tried to express its characters in a diagnosis. But it appears much more probable that the Tauric-Siberian and West European forms are local and analogous, not forming directly connected series, and that the circle of variation of each is thus to be drawn more narrowly. For this reason it was very valuable to hear an expression of the views of the English specialists on the limitation of the range of variation of their species. Very many common species constantly polymorphic in their German stations appeared to me to look very different in England, to represent in fact slightly differentiated examples of local endemism. How otherwise can we interpret the Birches for instance? How difficult it appears to be satisfactorily (it is not permissible to say "correctly") to limit the range of variation of *Betula odorata, pubescens* and

¹ Deutschlands Flora, 2, pp. 321-2.

verrucosa! How much we learned even on the first day at Cambridge from Dr. Moss in his interesting demonstrations of the South English forms of *Ulmus*.

To bring these fragmentary remarks to a conclusion, I may say that I gained the impression of numerous slightly differentiated local forms, endemic in England, and I think the study of such local forms can scarcely be satisfactorily developed in the herbarium, but belongs rather to the local floras of geographically and ecologically separate regions. *Cenanthe fluviatilis* Colem. which we saw so well in the River Cam, is given in Druce's List as an "endemic" species for thirty-one British and two Irish counties. If the same form occurs also in south-west Germany, the fact indicates that analogous ecological conditions have led to analogous "races" rather than that the same race has such a discontinuous distribution; and one may expect the identity of the forms to be incomplete.

UNIFORM FLORISTIC DISTRIBUTION IN THE BRITISH ISLES.

The question arises if the conditions of vegetation over the larger portion of the British Isles are so uniform as to furnish the conditions for the development of characteristic forms in this not inconsiderable area from the general stock of the west and north European flora which has been present in or has invaded the country since the Ice Age. I am inclined to answer this question in the affirmative in spite of the fact that Great Britain falls into a series of well-marked floristic regions.¹ At least on the lower hills, up to a height of about 100 m., there is apparent a uniformity, markedly differing from what we find in Mid-Germany, in the English and Scottish, and to some extent also in the Irish flora. Thus we find the same species distributed throughout the whole country to a much greater extent than we should expect over a range of nine degrees of latitude. And the cultivated areas, from the south of England to the valleys of the Grampians, contain species, whose growth is

¹ Thus there are the warm south-east of England with beechwoods on the slopes of the "Downs"; the east, drained by the rivers Ouse, Cam and Nene, with only 55 cm. of annual rainfall and a more continental climate; the Atlantic south-west (Cornwall); the similarly situated part of Ireland, which has, however, higher mountains; the limestone region of the north of England, in which *Sesleria cœrulea* occurs in spite of its curious absence from the south; and the fine mountain regions, differing from one another in many respects, with summits up to and exceeding 1000 m., from Glamorgan northwards through Wales (which we unfortunately could not visit), the Pennines, the mountains of Westmoreland and Cumberland, and finally the crown of all, the Grampians, which formed the northern limit of our tour.

clearly favoured by the climate, partly of mid-German origin and partly consisting of aliens which in Germany flourish scarcely anywhere in the open. Of the latter I will only mention *Araucaria imbricata*, whose fresh and flourishing appearance in the whole region of the Tay and in the gardens on Loch Tay itself, struck me very much, and *Acer Pseudoplatanus* whose magnificent growth is less remarkable, with *A. platanoides*, *Larix* and north-west American Conifers. The Sycamore is not wild in Great Britain, but spreads freely from self-sown seed, and, in the region of the Tay and even further north, attains dimensions which excite wonder and envy in one who is so familiar with the tree in his own mountains between Hercynia and the limit of deciduous forest in the Alps. Since *Acer campestre* is the only native species of the genus occurring in the British Isles, it is clear from this example that the country furnishes instances of *vegetational limits determined by developmental but not by climatic or ecological conditions*. Migrations are not completed, capacity for dispersal is not exhausted. It is difficult to say what circumstances have been effective in influencing the migrations of great trees with wind-borne seeds, such as *Acer Pseudoplatanus*, *A. platanoides*, *Picea excelsa*, *Abies alba*. It is seen here very clearly, that the often cited powers of distribution of seeds appear to be much greater theoretically than they prove to be in practice. By species which, when we consider the conditions obtaining in mid-Europe, I consider unexpectedly widely distributed through Great Britain, I mean such forms as *Ulex europaeus*, *Genista anglica*, *Erica Tetralix* and *cinerea*, *Myrrhis*, *Hippocrateis*, *Aquilegia*. *Ulex Gallii* goes at least as far north as Roxburgh; *Sagina nodosa* occurs from Cornwall to the Shetland Islands, though "its localities are rather dotted over the island than really continuous like those of the daisy (*Bellis*) and other more truly common species" (Watson, Topogr. Bot., p. 73). Even *Tamus communis*, which in Germany only touches the south-west, though it climbs in the alluvial woods of Strasburg with great luxuriance, is spread throughout England up to the Scottish border. *Wahlenbergia hederacea* occurs fairly continuously from Cornwall to the Scottish lowlands (56°N.) and beyond to Argyll. Nevertheless the northern mountains at about 55°N. do in many cases set a limit to the southern species, as in the case of *Tamus*, of which Watson says (Topogr. Bot., p. 407) "apparently quite absent from Scotland, although so nearly general to the counties of England."

These considerations may be emphasised by the following lists

taken from certain important genera, which may serve to bring into prominence a topic that has not hitherto received sufficient attention.

SPECIES REMARKABLE FOR THEIR OCCURRENCE IN THE BRITISH ISLES AND IN WEST-CENTRAL EUROPE.	SPECIES REMARKABLE FOR THEIR ABSENCE IN THE BRITISH ISLES.
<i>Thalictrum minus</i> , Brit. 32, Hib. 20 ¹	<i>T. aquilegifolium</i> (in Germany occupies an area similar to that of <i>Cirsium heterophyllum</i>).
<i>Pulsatilla vulgaris</i> (= <i>Anemone Pulsatilla</i>), Brit. 19.	<i>A. ranunculoides</i> .
<i>Anemone nemorosa</i> (common to Northern Scotland & throughout Ireland).	<i>Ranunculus lanuginosus</i> .
<i>Helleborus viridis</i> var. <i>occidentalis</i> Brit. 27.	<i>R. nemorosus</i> .
<i>H. fætidus</i> , Brit. 23.	<i>Nigella</i> .
<i>Trollius europæus</i> , Brit. 63, Hib. 3.	
<i>Aquilegia vulgaris</i> . Brit. 64, Hib. 31.	<i>A. Lycocotonum, Cammarum</i> .
<i>Aconitum Napellus</i> , Brit. 5.	<i>C. cava, C. solida, C. fabacea</i> .
<i>Actaea spicata</i> (York and West-moreland).	<i>G. germanica</i> .
<i>Corydalis claviculata</i> , Brit. 87, Hib. 5 (Denmark to Spain).	<i>T. montanum, T. alpestre, T. rubens, T. hybridum</i> .
<i>Genista anglica</i> , <i>G. pilosa</i> , <i>G. tinctoria</i> .	<i>A. cicer, Onobrychis</i> .
<i>Trifolium medium</i> , <i>T. ochroleucum</i> .	<i>Coronilla varia, C. montana, C. vaginalis</i> .
<i>Astragalus glycyphylloides</i> , Brit. 69.	
<i>A. danicus</i> , Brit. 45.	<i>V. cassubica</i> .
<i>Hippocrepis comosa</i> , Brit. 47!	
<i>Onobrychis viciaefolia</i> , Brit. 33.	<i>V. dumetorum</i> .
<i>Vicia Orobis</i> , Brit. 37 from Devon to 57°N.	<i>V. tenuifolia</i> .
<i>V. sylvatica</i> , Brit. 82, Hib. 22.	<i>L. vernus</i> !
<i>V. lathyroides</i> , Brit. 56, Hib. 6.	<i>L. platyphyllus, L. heterophyllum</i> , etc.
<i>Lathyrus montanus</i> , Brit. 108!	
<i>L. silvestris</i> , <i>L. niger</i> , <i>L. hirsutus</i> , <i>L. palustris</i> .	

¹ Number of Watson's counties in England, Wales and Scotland (Brit.), Ireland (Hib.)

SPECIES REMARKABLE FOR THEIR OCCURRENCE IN THE BRITISH ISLES AND IN WEST-CENTRAL EUROPE.	SPECIES REMARKABLE FOR THEIR ABSENCE IN THE BRITISH ISLES.
<i>Sanicula europaea.</i>	<i>Astrantia</i> , naturalised only.
<i>Eryngium campestre.</i>	<i>B. longifolium.</i>
<i>Bupleurum falcatum</i> , etc.	
<i>Myrrhis odorata</i> , Brit. 66, Hib. 13!	<i>Selinum carvifolium</i> (only Brit. 2-).
<i>Meum athamanticum</i> , Brit. 30.	<i>C. aromaticum</i> , <i>C. aureum</i> (indigenous in Scotland?), <i>C. hirsutum</i> .
<i>Charophyllum temulum</i> .	
<i>Libanotis</i> (= <i>Seseli Libanotis</i>), Sussex, Herts., Cambs.	<i>Seseli</i> spp.
<i>Peucedanum palustre</i> , <i>officinale</i> (rare).	<i>P. Cervaria</i> , <i>Oreoselinum</i> .
<i>Leucojum aestivum</i> (rare).	<i>Laserpitium Siler</i> .
<i>Paris quadrifolia</i> (Somerset and Kent to Scotland).	<i>L. vernum</i> , naturalised only.
<i>Fritillaria Meleagris</i> , Brit. 22.	<i>Maianthemum bifolium</i> (perhaps wild only in Yorks.)
<i>Gagea lutea</i> .	<i>Lilium bulbiferum</i> , <i>L. Martagon</i> .
<i>Scilla verna</i> , <i>S. autumnalis</i> .	<i>Gagea</i> (all other species).
<i>Colchicum autumnale</i> .	<i>Anthericum Liliago</i> .
	<i>A. ramosum</i> .

GERMAN SPECIES WITH STRIKING BRITISH DISTRIBUTION.

SPECIES.	GERMANY.	GREAT BRITAIN.
<i>Phyteuma spicatum</i> ...	Common up to the N.W.	One or two localities in the S.E.
<i>P. orbiculare</i> ...	Montane: finishes towards the N.W. (Harz)	South English: chalk downs.
<i>Campanula latifolia</i> ...	Montane, not in N.W.	Surrey & Gloucester to Central Scotland; on the whole sub-montane.
<i>C. Rapunculus</i> ...	Widely spread ...	Doubtfully wild.
<i>Primula elatior</i> ...	The commonest species on siliceous soils	Only in four counties round Cambridge: on chalky boulder clay and in alluvial fens.

SPECIES.	GERMANY.	GREAT BRITAIN.
<i>P. officinalis</i> ...	On calcareous soils, quite absent from N.W.	Through the whole of England to Scotland: no mar- ked soil preference.
<i>P. vulgaris</i> (<i>acaulis</i>)	Absent between the Alps and the north coast, though com- mon in France ...	The commonest spe- cies throughout the British Isles.
<i>Cirsium oleraceum</i> ...	Common in alluvial meadows up to East Friesland ...	Absent.
<i>C. anglicum</i> (<i>britan-</i> <i>nicum</i>)= <i>C. pratense</i>	Rare in East Fries- land: otherwise absent	Occurs in 49 English and 40 Irish coun- ties: local.
<i>C. heterophyllum</i> ...	On siliceous soils. Montane up to Thuringia, Baltic region.	On siliceous and calcareous soils from Glamorgan to nor- thern Scotland.

This list might be very greatly extended, but it suffices to indicate the material available for the developmental study of the flora.

Although for the sake of contrast a few West European species, such as *Corydalis claviculata*, have been introduced into these lists, yet it may safely be stated that the great bulk of the species common to Great Britain and Central Germany consists of species with a wide montane distribution in Central Europe, often extending towards the east or into the Alpine countries. The lists may help to give an idea how apparently capriciously Great Britain has made her selection of these species. The question is worth some discussion, because certain important factors in distribution, which have not yet received attention, are involved.

ORIGIN OF THE BRITISH FLORA.

At the meeting of the British Association at Portsmouth (where we were handsomely entertained as guests of the Mayor at the conclusion of our journey) we had the pleasure of joining in the stimulating discussions of the Botanical Section. Clement Reid, in a paper read before this Section, developed with much acuteness an argument in which he answered the question of the origin of the British and Irish flora by supposing that the arctic-glacial element of the flora present after melting of the ice was enriched from the

neighbouring continent by immigration due to dispersal of continental species by wind, birds, etc. Without wishing to deny the existence of this factor, I consider the mixture of floristic elements already present in England at the close of the Baltic ice period, which forms, for Germany, the starting point of the last great transformation of vegetation, as very important. In the southern part of England, which remained free of ice at the time of the greatest extension of glaciers, and which in the last (Baltic) ice period would have possessed mild climatic conditions on account of its maritime situation, I consider the ground stock of species to have been settled. The species of this stock afterwards extended further north, and constantly won fresh ground from the northern floristic elements. According to this view the flora of Great Britain would still to-day give an indication as to the distribution of species at that time, a distribution which was much more freely and profoundly modified on the continent owing to the stronger influence of the Steppe period. Thus many species, such as *Digitalis purpurea*, *Meum athamanticum*, *Thlaspi alpestre*, *Helleborus foetidus*, range from the Pyrenees and Western Alps through France and Belgium, on the one side to Scotland, on the other eastwards to the Harz, Thuringia or Saxony, but stop at the Sudetes, which stood completely in the line of the Ural-East Baltic invasion characterised by *Ledum*, *Vaccinium uliginosum*, *Carex pauciflora*, *Betula nana* and *Pedicularis sudetica*. In addition there are many other species of common mid-European distribution, and the occurrence of these in the British Isles with an increasing distribution towards the north and west gives very important indications which have hitherto not been sufficiently considered. It is also noteworthy that most of the plants given in the list above are absent from Cornwall and appear first in Devon, Somerset and Dorset (for instance so common a plant, distinguished by its preference for cool damp soils, as *Geum rivale*). Others are such common German hill plants of drier ground as *Potentilla verna*, which begins in the English "continental" region round Cambridge and preferring the east of England reaches as far north as Edinburgh. All this makes very much more the impression of an ordered distribution than of chance invasion; but the latter factor has also no doubt been always at work. The views expressed by Clement Reid are based mostly on single very remarkable species (such as *Arbutus*, *Dabeocia*, *Erica vagans* and *ciliaris*, which are very isolated) and neglect the distributional relations of the great bulk of species, which we must consider in

attempting to explain the striking absence of characteristic species of the various plant-associations.

ARCTIC-ALPINE ELEMENT.

The distribution of the arctic-alpine element through Great Britain is also of very great interest, both on account of the low altitude of the stations of many species and of their concentration in definite parts of the country. The very useful tables published by E. Warming¹ on the Flora of Greenland, Iceland and the Faroës in comparison with North America, North and Mid-Europe and Siberia, furnish a basis for my calculations. Of the very great number of northern species occurring in the British Isles, forty-four are confined, within the British Isles, to the higher mountains: of these, nine are absent from the mid-European mountains (Sudetes, Hercynia, etc.) and from the Alps, and are in this sense arctic, e.g., *Poa arctica (flexuosa)* and *Alopecurus alpinus*. But of the much greater group of British species which are scattered through the hills and moors of the islands, (such as *Dryas*, *Primula farinosa*, *Selaginella spinulosa*, *Pinguicula*, etc., etc.) fourteen are likewise absent from the "arctic" areas of mid-Germany and from the German Alps, e.g., *Aira alpina*, *Carex pulla (saxatilis)*, *C. binervis*, *C. alpicola*. The stations of these species, both of those occurring in, and of those absent from mid-Europe, are very variously scattered in Great Britain, much more so than in Germany, where they either inhabit the line of retreat of the Baltic ice from East Prussia to Holstein; or moors on the old terminal moraines, for instance in Silesia and in Upper Bavaria; or, and mainly, the moors lying in the depressions of the mountains as well as in mountain ravines, on mountain rocks, etc. (*Gratformationen*)² above the tree-limit.

The British stations fall into four main regions of the British Isles:—

1. Wales.
2. Cumberland, Westmoreland, N.W. Yorkshire, etc.
3. The Grampians from Ben Lawers northwards.
4. The scattered hill and mountain chains of West Ireland, especially round Galway Bay, in West Galway, Mayo and Sligo. It is of great interest that special species occur in each of these counties and that, as it seems to me, the species of phytogeographical interest having a distribution through all of them are very few.

¹ Vidensk. Meddel. fra den naturhist. Forening: Kjöbenhavn, 27 Jan. 188: especially p. 45.

² cf. W. G. Smith. "Types of British Vegetation," Chap. XII. and the literature there cited.

Of these species I select *Potentilla fruticosa*, which we saw in the station figured by R. Ll. Praeger in his "Tourist's Flora of the West of Ireland," p. 140. This station has no special orographical features: it lies south of Galway Bay, almost at sea level, in a shallow depression of the cattle pasture. There, as Praeger says, the plant is dominant:—"Generally abundant where it occurs, sometimes almost entirely usurping the ground over an acre or two, as behind Ballyvaghan," (*l.c.*). Clare, Galway and Mayo contain the Irish Stations, the English belong to the second of the above mentioned regions. Nowhere else in the British Isles is the plant wild. Let us now compare the other European stations. The Pyrenean plant is reckoned as another species or at least a distinct race—*P. prostrata* Lap. In the often cited single German station, Wemding in the North Keuper district of Bavaria the plant may be regarded as dying out or perhaps as naturalised only. In addition there are South-East Russia and Oeland. These relict stations have no connexion with each other, and since *Potentilla fruticosa* is a plant of quite different climatic conditions from the chomophytes, its occurrence throws a bright ray of light on the post-glacial development of the British flora: the species has occupied its present stations since the Baltic ice period, if not longer.

Carnarvon, in the north-west corner of Wales, is distinguished by the sole possession of *Lloydia serotina*. *Saxifraga nivalis* has here its southernmost station in the British Isles, reaching northwards to 57° N. *Saxifraga rivularis* does not extend south of Ben Lawers, and ranges northwards to Westerness (57°N.) so far as I can follow the stations. *Sagina nivalis* is confined to Ben Lawers and quite a narrow area of the Scottish mountain region, *S. saxatilis* to the same region, from Ben Lawers to the north coast. These cases indicate the scattered type of distribution of the arctic-alpine plants of the British Isles. This is not, as in the Alps, a result of local endemism in the different regions combined with arctic invasion from the north, but rather a case of the colonisation of the arctic flora during the Glacial Period, the present fixed stations having been occupied at the close of the Baltic ice period. *Dryas octopetala* is one of the species which connects England, Scotland and Ireland, ranging from Carnarvon by Westmoreland to Perth and the Orkneys, and in Ireland is scattered over ten counties of Praeger's map. The habitats of this species on Black Head, south of Galway Bay, are very remarkable. At slight altitudes (100 m.) on the limestone slopes it occurs with *Euphrasia salisburgensis*,

Sesleria, Calluna, Erica and *Empetrum*. Higher up it occurs with *Rubia peregrina* and *Arctostaphylos Uva-ursi*; and at 200 m., in the clefts of the hard limestone, with *Scopolendrium*, *Adiantum Capillus-veneris* (rare), and *Habenaria intacta* in part of its "limited and probably continuous range along the western edge of the Limestone Plain from Burren to Cong" (*Praeger, op. cit.*). I know of no similar example in the German and north Alpine Flora of so perverse a distribution and mixture of relict-stations.

THE STRUCTURE OF THE PLANT-FORMATIONS.

It appears to me natural, in all detailed work, at least on the formations of dry ground, to maintain the threefold division of the British Isles into the formations of southern and eastern England, those of Scotland, including the siliceous mountains of northern England over 250 m. (or at least over 1000 English feet), and finally those of Ireland and Cornwall.¹ Wales probably shares in the character of all three of these divisions, but we had no opportunity of seeing this highly interesting country.

It is necessary to premise that only the first of these divisions can be usefully compared with mid-Europe (Germany including the northern Alps). The north of Great Britain must be compared with Scandinavia and the Faroës, the west of Ireland and Cornwall with the north-western French peninsula (Brittany) and with the Asturias, etc.

WOODLAND, SCRUB, ETC., IN SOUTHERN ENGLAND.

The woods of the south and east English region show at once a striking deficiency as compared with those of the German plains and hills in the absence of *Pinus silvestris*. This tree, though very abundant on sandy soils, is not generally regarded as native in the south-east, though it was apparently general in early post-glacial times.² In the counties which I saw the oak and the ash, on the southern chalk the beech (with yew), and on the higher siliceous hills the birch (the oak scarcely ascends beyond 300 m.), especially *B. pubescens* (which, as compared with Germany, takes a relatively prominent position), were practically the only dominant trees, where

¹ *Fagus sylvatica* (characteristic of south east England) is nevertheless recorded as wild in Cornwall, while in Ireland, as is well-known, it is absent.

² See "The Woodlands of England" by Moss, Rankin and Tansley, *NEW PHYTOLOGIST*, IX, 1910. The possibility, however, of the nativity of *Pinus* in the south-east of England is there suggested, p. 134.

in Germany we should expect to see a much greater variety of both trees and shrubs. I never saw in England that delightful mixture of various trees presented by a mid-German valley traversed by a murmuring brook, where behind the alders (*Alnus glutinosa* and *A. incana*—the latter absent from England) the hornbeam (*Carpinus Betulus*) is mixed with *Acer platanoides* or *Pseudoplatanus*, *Ulmus*, *Tilia* and *Sorbus Aucuparia*, on the valley sides giving place to closed beechwoods with *Picea* and *Abies*, and making way for *Pinus silvestris* on the steeper and drier slopes. But instead, the beautiful ashwoods are highly developed in England, as I only remember to have seen them here and there on basaltic hills or in East Prussia. *Ulmus*, *Populus tremula* and *Corylus* are generally present in England as in Germany, and at higher altitudes *Sorbus Aucuparia* becomes more important. *Ilex* and *Hedera* betray the west-European influence by their abundance in the lower layers, even far to the north.

Many of the species, both of the woods, and of the open copses, scrub, and commons, which in England are known as south-western, have a very different distribution on the Continent. Two examples are *Daphne Laureola* and *Lithospermum purpureo-caruleum*, both absent from Ireland. *D. Laureola* is distributed from Devon northwards to York and Durham. Besides France, Aragon, North Italy and southern Switzerland, the area of these two species extends far into the south-east of Europe—Austria, Hungary, Slavonia, Herzegovina, Bosnia, Servia and southern Russia, so that many such species are reckoned in Germany as “south-eastern”! *Daphne Laureola*, however, is typically absent from the whole of Germany as far as Austria and the Swiss Jura. But other species are specifically south-western, extending from Spain to Holland and East Friesland: e.g., *Endymion nutans*=*Scilla non-scripta*, of whose abundance in England, even in the northern woods, we often had striking evidence.

While always bearing in mind this strong western character, even in the south-east of England, we can say, then, that the south British plant-formations, wood, low calcareous hill-flora with scrub, lowland meadows, and lowland heaths on peaty soil, are constructed very much as would be the case if low calcareous hills were present, say, in south Hanover on the edge of the north-west German moor and swamplands. I am thinking, for instance, of the scenery of South Hampshire, such as Beaulieu Heath and the beautiful beechwoods on the higher ground of the New Forest, with *Ruscus*

and *Ilex*. On the lowlying heaths, besides all the characteristic species of the western Lüneburger Heide, there are dominant *Erica Tetralix*, much *Myrica*, *Narthecium*, masses of *Hypericum Elodes*, such as would be impossible in Germany, and, on drier sands, *Erica cinerea* and *Ulex*, giving the English stamp to the vegetation. And in the same region there are the Downs, calcareous hilly country from which one sees no heath, but only ash and beechwoods, with *Sorbus Aria* and *Viburnum Lantana*, while luxuriant lianes of *Clematis Vitalba*, *Bryonia dioica* and *Tamus* climb over the scrub, the thorny *Crataegus* forms picturesque outlines on the bare hillsides, and *Conyza*, *Senecio Jacobaea* and *Cirsium acaule*, as in Germany, are characteristic herbs. But one seeks in vain for such species as *Cynanchum Vincetoxicum*, which in similar German vegetation would scarcely be absent: likewise for *Anthericum* or *Peucedanum Cervaria* in rubbly places. Thus in south-east England the mid-German hill plants make incomplete formations and the missing members are not replaced by others absent from Germany.

On the other hand, on the heaths developed on detrital sands, with *Erica cinerea* we get *Ulex europaeus*, in the south *U. minor (nanus)*, and in the west *U. Gallii*, which often take the positions that would be occupied in mid-Germany by the "dry hill-flora"¹ with a mixture of genuine steppe-plants. The hill-plants of England do not appear to be very exacting in regard to dryness, since for instance, *Geranium sanguineum* occurs in many stations on the limestone of the west coast of Ireland, mixed with *Rubia peregrina*. It is indeed commoner in the damper north and west than in the drier south-east.

THE NORTH BRITISH HILLS AND MOORS.

This flora with its numerous resemblances to that of Central Europe goes far northwards on the limestone—we botanised among it in the valleys of the Rivers Wye and Derwent in north Derbyshire—and the scenery with its bare grassy hills (about 400 m.—1200 to 1400 English feet) and ashwoods on the damper valley slopes often resembles the equally bare dolomites of the Eifel, without assuming any strongly montane character. *Helianthemum*, *Sanguisorba*, *Scabiosa*, *Geranium sanguineum*, with forms of *Rosa mollis*, are the characteristic plants, while *Sesleria cœrulea* begins quite suddenly on the limestone further north (Yorkshire) beyond a barrier of siliceous rocks.

¹ cf. Drude, *Hercynischer Florenbezirk (Vegetation d. Erde, 6).*

The hard "grit" and the shales of the Carboniferous formation give rise to hills with slightly rounded summits to which the "Peak" of Derbyshire belongs. We visited these hills between Crowden and Greenfield and between Greenfield and Huddersfield in southwest Yorkshire and here, where the water parting between the North Sea and the Irish Sea reaches a height of only 540 m., the immense difference between the zones of vegetation and those of Central Germany become very clear. Woodland stops at an astonishingly low level: dwarf shrubs and heath, with arctic-boreal elements, and also Nardetum, begin extremely soon: on screes *Pteridium* forms a pure association in full sun and extends to a high level, till it is replaced (about 350 m.) by a new association. The flat summits are covered with widely extended peat-moors, which are not situated in depressions surrounded by ridges and peaks, as on the German mountains, but are developed on the gently rolling summits themselves. On the edges of these highlying plateaux, the moor breaks off sharply into a steep slope covered with *Vaccinium Myrtillus*, from which the rain-water flows out and collects into mountain streams. On the moor plateaux themselves the power of the water is seen in numerous rifts and channels dividing the vegetation of the "Hochmoor" into areas, from the sides of which the peat is worn away, and which form in dry weather most convenient passages between the plants of the moor scrub.

This marked depression of all altitudinal limits is without any doubt the consequence of the damp rainy climate: although the last snowfalls may take place after Easter, the snow rarely lies continuously for many weeks during winter. In Germany also we have a depression of altitudinal limits towards the damper west. The moors of the Harz, whose vegetation of *Myrtilleto-Empetretum* with *V. Vitis-idaea*, *Trichophorum cæspitosum* (=*Scirpus cæspitosus*) and *Eriophorum vaginatum* may be compared with the British, extend from 700 m. to 1080 m., but they lie in hollows which are covered with snow during the winter, or on the flat sides of the summits surrounded by woods of *Picea*. The difference of latitude from the Pennines is only 2°.

Of the social species of the Pennine moors, *Rubus Chamæmorus*, which forms larger masses than I have ever seen in the best East Prussian "Hochmoor," is very noteworthy. This plant only reaches a few places of the German mountain moors in the Riesengebirge, at about 1000 m.

But the absence of *Vaccinium uliginosum* appeared to me even more remarkable (*Oxycoccus* ranges from Somerset to northern Scotland). The so-called "Moorbeere" (*Vaccinium uliginosum*), which is never absent from German "Hochmoor," either on the northern plain or the mountains, which lives on the sand-dunes of the North Sea islands, and which, in the mountains from 700 m. upwards, suppresses *Vaccinium Myrtillus* and *Vitis-Idaea*, is quite absent from the south of Great Britain, occurring only from Durham and Westmoreland northward to the Orkneys. But even in Scotland, in the parts visited by us, I never saw the plant, though I was on the look-out, so that it cannot be social and abundant. It shares the distribution of *Linnæa*, and thus with that plant and *Arctostaphylos Uva-ursi* unites the second and third groups of stations of northern plants given on p. 244. *Andromeda polifolia*, on the other hand, occurs so far south as Norfolk and Somerset.

LOW ALTITUDINAL LIMITS OF THE FORMATIONS.

The altered scenery with the uncommonly low occurrence of boreal-arctic species in the mild winter climate of Great Britain is unquestionably ecologically facilitated by the damp stormy summers which have suppressed the growth of trees. In our excursions in the Pennines I saw even in deep sheltered clefts, besides weak dwarf trees of *Quercus sessiliflora* and *Betula pubescens*, only massive stems of *Sorbus Aucuparia* laden with red fruit: 100 m. higher nothing but "Hochmoor" covered the flat-topped summits and ridges. On free slopes we found as low as 250 m., between *Pteridium* and *Agrostis*, great masses of *Empetrum nigrum*. I recall that *Empetrum* occurs also on the German coast where it is exposed to damp sea-winds, and sparingly on sandstones in Saxon Switzerland at about 300 m. where damp rock clefts covered with *Sphagnum* afford a moist and cool mountain climate. But in general *Empetrum* does not occur on peat moors below 700 m. and becomes abundant at about 1000 m., growing mostly at and above the tree-limit on free summits in the sun.

A great difference would be introduced into the physiognomy of the vegetation if *Picea excelsa* were a definite component and formed a considerable zone between the uppermost deciduous trees and the arctic-boreal associations of dwarf shrubs. In Central Europe also, if the Spruce is absent, the grass, heath and moor formations generally descend to lower altitudes. In Hercynia I recall the magnificent meadows above the beechwoods of the

basaltic summit of the Rhön; and on the boundaries of the mountain woods in the Vosges, where dwarf communities of *Fagus silvatica* compete with mountain meadows. It appears to me certain that the Spruce spreads subs spontaneously in the south of England¹, like the Sycamore and especially the Pine, and that it might become fully naturalised: it would be of great interest to try by cultivation experiments how the tree would behave on siliceous hills of more than 400 m. in height, if it were able to defy the rainy stormy British summers. One would think it could not find worse conditions than on the swampy moory slopes of the Riesengebirge at 1200 m.

THE HIGHER MOUNTAINS.

At such a height as this in Great Britain the dwarf shrub formations and the closed Nardetum has already been long superseded by the Chomophytes, the ridge ("Grat") formation or the associations on high mountain rocks, where, between dwarf willows and mosses, rare arctic species like *Sagina nivalis* on Ben Lawers have their isolated stations.

If certain mountains in the Grampians or in Cumberland are ascended one finds first at a height of only about 250 m., surrounded by Pteridetum or Nardeto-Agrostidetum, sun-loving species such as *Saxifraga aizoides*, *Cochlearia*, *Pinguicula* and *Selaginella*, with *Chrysosplenium* in the mountain streams and round springs; not shade-loving species like *Ranunculus aconitifolius* and *Mulgedium* in the German mountains. Only at a higher level up to about 600 m. the sides of the mountains are occupied by *Calluna*, after *Pteridium* has disappeared and given place to tufts of *Cryptogramme* at 400 m. The heaths of the mid-German mountains, on the other hand, at and above the tree limit (1000—1300 m.), attain a very strong development with *Calluna* and *Vaccinium uliginosum*, and *Calluna* alone is in Germany more dominant and more widely spread than in the British mountains which I had the opportunity of seeing.² From 500 to 700 m. the Nardetum, with *Juncetum squarrosum*, is at its strongest, and above this level *Empetrum*, *Alchemilla alpina* and *Pinguicula* begin to be so abundant that the turf has as much right to be called sub-alpine sward as the similar community of *Homogyne*, *Luzula sudetica* and *Trientalis* in the German Mittelgebirge at 1000—1200 m. A greater abundance of characteristic species naturally occurs round the cold springs: thus

¹ I know of no evidence for this belief. [Ed. NEW PHYT.]

² In the Eastern Highlands of Scotland, however, *Callunetum* covers very wide areas on the mountain sides. Cf. "Types of British Vegetation," p. 113. [Ed. NEW PHYT.]

at 800 m. *Saxifraga stellaris*, at 900 m. *Luzula spicata* and *Sibbaldia*, at 950 m. *Carex saxatilis* (with *Bellis perennis* and *Chrysosplenium*); and above 1000 m. the pure arctic-boreal associations, are found i.e., some 500 m. lower than in the Riesengebirge and Böhmerwald. On Ben Lawers *Fucus trifidus* descends to 900 m.: in corresponding places on the Riesengebirge (east slope of the Schneekoppe), where it likewise forms closed communities, only to 1420 m.

LOWLAND HEATHS.

The lowland heaths, the "heath association" or "*Callunetum arenosum*" of Tansley,¹ for the most part correspond with those of north-western Germany in the region of the Weser and the Ems, and on the English heaths one would often feel oneself transported to Germany if it were not for the sudden occurrence of *Erica cinerea* between *Tetralix* and *Calluna*, or of *Ulex minor* or *Gallii*, with masses of *Schenus nigricans*, *Myrica Gale*, *Narthecium* and *Hypericum Elodes*, which indicate the west-European conditions. Especially striking is the purely western "Cornish heath," *Erica vagans*, on the Lizard peninsula, which is by no means a rarity, but occurs as the most important constituent of the whole heath formation in that locality. For the rest, Tansley's remark² that "most of the species of south-west European plants for which the Lizard district is famous occur on the grassland of the sea cliffs or in their clefts, and not on the heaths" is of great interest.

AQUATIC FORMATIONS.

The formations of water-plants, floating and submerged, the reedswamps and infra-aquatic fens, and finally the fen woods of *Alnus*, *Betula pubescens* and *Salix cinerea*, (with *Humulus* and *Lonicera* as lianes, and luxuriant *Osmunda regalis*) developed from reedswamp and fen, with which we became acquainted in the Norfolk Broads under the admirable leadership of Miss Marietta Pallis, are so interesting that it is impossible to pass them over. The great effectiveness of the methods pursued in England and America, which direct ecological investigation mainly to the association, and the connection or replacement, of groups of species under the stress of changing soil conditions, here became especially apparent.

It seems probable that formations corresponding with those of the Norfolk Broads, if not so variously developed or on equivalent ground, might be found in the north German plain, perhaps in the Spreewald or at Drömling. If so, a comparison would be interesting,

¹ "Types of British Vegetation," pp. 103 *et seq.*

² "Types," p. 110.

since it is likely that the dominant species, with the exception of a few west European ones, would be the same.

The transformation of associations, the production of "carr" (fen wood) up to the point at which *Fraxinus* and *Quercus* enter the association of bushes and trees, is still going on before our eyes, and is strikingly characteristic of the Norfolk Broads area.

In connexion with the remark in "Types" (p. 235): "The establishment of Sphagneta and the presence of moor associations on the fen suggest that the fen association may pass into the moor-formation," I may remark on the possibility that many great "Hochmoor" regions, such as for instance that near Königsberg on the coast of East Prussia may similarly be derived from "fen."

We also had the opportunity of studying many interesting water plants, partly in communities, partly as species, and not least the famous *Eriocaulon septangulare* in Galway, one of its seven Irish stations, "ranging up the whole west coast, but avoiding the limestone tracts."¹ So much has been said about the remarkable occurrence of this North American plant that I will confine myself to one remark. The circumstance has perhaps been too much overlooked that several commoner or rarer species which do not belong to the circumpolar boreal floristic element, occur in both North America and West Europe, though *Eriocaulon* is the only one whose European distribution is confined to Ireland. Thus *Lobelia Dortmanna*, which ranges as far as the Lüneburger Heide as a rarity, is distributed in the swamps of New England up to North Pennsylvania, and from Lake Superior northwards into Canada; while an allied species, *L. paludosa*, ranges from Delaware to Florida and Louisiana. *L. Dortmanna* is thus the species suited to a cooler climate: it strikingly avoids southern England and extends from South Wales through Cumberland to the Shetland Islands. *Ligusticum (Haloscias) scoticum* has a similar distribution. In the New World it is distributed from the Behring Sea to Canada and Labrador: in the British Isles it occurs in five counties of the north coast of Ireland, from which it extends to northern England and Scotland. Of water plants *Subularia aquatica* occurs in North America (Yellowstone, etc. in the west, Maine and New Hampshire in the east), and also *Isnardia palustris* and *Lysimachia thyrsiflora*: of bog-moss plants *Drosera intermedia*. There are in fact a number of plants with interesting distributions of this sort which on this side of the Atlantic we mostly call west European, without mentioning their connexion with North America.

¹ Praeger, "Irish Topographical Botany," p. 330.

COAST FORMATIONS.

The coast formations naturally formed a very attractive feature in our studies in Great Britain, especially as the chapter (XIV) of "Types" dealing with them, and also Professor F. W. Oliver's special explanations and lists of flora relating to Blakeney on the coast of Norfolk, formed an excellent preparation for their examination. But the comparison with the German flora can be very briefly dismissed, since Germany possesses very little of interest in comparison with Great Britain, and the arrangement of the formations on the flat sandy beach of the German coast of the North Sea is poor and monotonous compared with the magnificent alternations of rocky coast, shingle-banks and extended salt-marshes and sand-dunes with the dune hollows behind the main dunes, where *Salix repens*, just as in Belgium, plays such a noteworthy part in the association. So far as my knowledge extends, the German Baltic coast possesses only one or two species of interest which are absent from Britain, e.g., *Linaria odora*. The magnificent structure of the formations on flat or steep rocky coasts, as we saw it on the coast of Cornwall, with the stations of *Crithmum maritimum*, has its only German analogue in Heligoland. Such interesting plants as *Crambe maritima*, which ranges from the east coast of Ireland and from Cornwall to the Scottish west coast (56°N.) are only found as rarities in Holstein, Mecklenburg and Rügen. *Brassica oleracea*, which grows apparently wild on the Heligoland cliffs, is claimed with equal right as wild from Cornwall to Carnarvon. Further, England has many species, e.g., *Euphorbia Paralias* and *portlandica*, which do not occur at all on the German coasts, and also species such as *Suaeda fruticosa* which exhibit plant-forms uncommon on the coasts of northern Europe. Even the meadow-like damp dune flats, which exist in the East Frisian islands, are fuller of flowers and of species in England.

Much is still left to say of the remarkable plants and their ecological relations shown to us by our kindly leaders, and of the points which struck us as visitors accustomed to formations of similar structure but of quite different floristic composition. But these remarks might easily grow into a small book and the most important points of the comparison fall into the background. Enough has been written to show how stimulating was this "I.P.E." Under its flag, which Tansley untiringly held aloft, we spent

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extraordinarily instructive days, days penetrated too by the gladdest spirit of comradeship, days which we shall always remember for their strong and beautiful impressions of the world of British vegetation. I can only conclude with the hope that the pleasure which the writer of these notes himself found in the experience may find its echo in the hearts of all our British guides.

IX—EINIGE VERGLEICHE ZWISCHEN BRITISCHER UND
SCHWEIZERISCHER VEGETATION.
VON C. SCHRÖTER.

ZUNÄCHST schliesse ich mich aus vollem Herzen all den dankenden und lobenden Aussprüchen der übrigen "Foreign members" der internationalen Phytogeographischen Exkursion über die unvergesslichen Tage an, die wir der Gastfreundschaft unserer britischen Freunde zu verdanken hatten.

Sie waren eminent fördernd für uns, diese Tage, durch die dargebotene grosse Summe wissenschaftlicher Erfahrungen und Diskussionen über pflanzengeographische Begriffe, anregend durch die vorbildliche Art, in welcher die britische Phytogeographie arbeitet, reich durch die ununterbrochene Serie interessanter Vegetationen und schöner landschaftlicher Szenerien, und herzerquickend durch die Freundschaft sympathischer Kollegen.

Die vorausgehenden Erörterungen meiner kontinentalen und amerikanischen Gäste haben fast alles schon gestreift, was ich von besonders interessanten Erscheinungen zu sagen hätte. Ich muss mich deshalb auf ganz wenige Punkte allgemeiner Natur beschränken.

1. Die Organisation des Phytogeographischen "Survey" in Grossbritannien hat meine Bewunderung, besonders durch folgende Momente erregt: die Leitung durch ein Comité, die eine einheitliche Gestaltung verbürgt; die rasche und erfolgreiche Anhandnahme der "primären" kartographischen Darstellungen in 1 : 63360, basiert auf einer vorausgegangene Einigung über Nomenklatur und Farbengebung; die grosse Zahl junger, enthusiastisch arbeitender Männer die nun zum Teil schon die eingehendere Detailarbeit

in grösserem Masstab unternehmen ; das freundschaftliche Zusammenspiel aller Kräfte und endlich, "last not least," die geistige Beweglichkeit der englischen Botaniker, die es mit sich brachte, dass eine ganze Anzahl vorher auf andern Gebieten in hervorragender Weise tätiger Gelehrter sich der aufblühenden Richtung zuwandte. Dadurch wurde eine Menge neuer, insbesondere physiologischer Gesichtspunkte in die Pflanzengeographie hineingetragen, und so kam in überraschend kurzer Zeit eine bedeutende Summe phytogeographischer Ergebnisse zu Stande.

Das dabei die von Clements und Cowles in unsere Wissenschaft eingeführte dynamische Fragestellung in hervorragender Weise als Leitmotiv diente, macht diese Ergebnisse für uns Kontinentale besonders lehrreich, da bei uns diese Fragen erst gestreift wurden.

Die schönen phytogeographischen Arbeiten des auch botanisch geschulten schottischen Geologen Crampton zeigen deutlich, wie notwendig und fruchtbar für diese Richtung umgekehrt eine tüchtige geologische Schulung des Phytogeographen sein muss.

In all' diesen Dingen können wir Kontinentalen vieles von unseren britischen Kollegen lernen !

2. Mit Bezug auf die Vegetation möchte ich zunächst einige Punkte im Vergleich mit unserem schweizerischen Mittellande zwischen Alpen und Jura streifen, das als regenreiches Laubholzgebiet am ehesten sich mit Grossbritannien und namentlich mit England im engeren Sinne vergleichen lässt.

Ganz auffallend ist der Unterschied in der *anthropogenen Umformung* der Vegetation, in dem Einflusse des Menschen auf die Pflanzendecke, in England einerseits, in der Schweiz anderseits. Betrachten wir zunächst die Wälder.

In Grossbritannien wie in der Schweiz haben wir im unterhalb der Baumgrenze liegenden Gebiete ein ausgesprochenes Gehölzklima ; es ist also der Wald seit der Herrschaft der jetzigen Bedingungen die klimatische "Klimaxformation."

Waldfrei waren in Grossbritannien (nach Tansley) nur : Die salzhaltigen Böden und Strandwälle (shingle beaches) der Meeresküste, die Wanderdünen, wahrscheinlich manche arme Kalkböden mit primärem Grasland (so z.B. auf den "Downs"), wahrscheinlich auch manche arme Sandböden mit primärer Heide, die Rohrsümpfe und Hochmoore, die Schotterbänke der Flüsse.

Waldfrei waren im schweizerischen Mittelland zwischen Jura und Alpen : die Moore zum Teil, die Rohrsümpfe der Seeufer, die

vom prähistorischen Menschen besiedelten und durch ihn waldfrei gehaltenen steppenähnlichen Flächen,¹ zu steile Hänge, die Schotter der Flussalluvionen und Bachschuttkegel.

In beiden Ländern räumte der Mensch mit den ursprünglichen Wäldern gewaltig auf: im schweizerischen Mittelland macht gegenwärtig der Wald nur noch 21% der Gesamtfläche aus (nach Coaz, 1888); in Grossbritannien wurde die Bewaldung herabgedrückt auf 1·5% (Irland), 3·9% (Wales), 4·6% (Schottland) und 5·3% (England); es gehört zu den waldärmsten Ländern Europas. In beiden Ländern sind Gebüsche, Aecker, Wiesen, Streurieder und Weiden, in der Schweiz auch Rebgelände, in Grossbritannien außerdem der grössere Teil des Heide- und Moorlandes dem Walde abgerungene Kultur- oder Halbkulturformationen.

Das Schicksal der übriggebliebenen Wälder war aber ein ganz verschiedenes: in England wurden sie relativ wenig verändert, bei uns sehr stark. Tansley, Moss and Rankin ("The Woodlands of England," NEW PHYTOLOGIST, Vol. IX, Nr. 3-4, 1910) sind wohl mit Recht der Ansicht, dass die grosse Mehrzahl der englischen Wälder als "halbnatürliche" betrachtet werden kann, als Abkömmlinge der primitiven Wälder, durch Behandlung und Pflanzung nur wenig geändert. Das beruht auf dem Konservatismus der englischen Landeigentümer, auf den Eigentumsverhältnissen (Privateigentum herrscht weit vor), auf dem Vorherrschen des *jagdlichen* Interesses (die Wälder dienen vielfach als Fasanen- und Fuchsgehege, der Holzertrag tritt zurück) und auf der allgemein zugegebenen Rückständigkeit der englischen Forstwirtschaft. So resultiert der für die Phytographen sehr erfreuliche Zustand, dass die allerdings spärlichen heutigen Waldreste Grossbritanniens—wie wir uns ständig überzeugen konnten—die ursprünglichen Beziehungen zu Boden und Klima noch deutlich zeigen.

Dieses Verhalten erklärt auch die starke Betonung des Bodens als Grundlage der Formations-Charakteristik in der Auffassung unserer englischen Kollegen. Sie finden im Gebiet des Gehölzklimas fast überall eine retrogressive Sukzession von Wald durch Gebüsch zum Grasland: ob auf natürlichem oder anthropogenem Wege, ist freilich vielfach strittig. Die noch vorhandenen Waldreste zeigen sich sehr verschieden auf verschiedenen Böden: so ergibt sich ganz natürlich die Tendenz, die Vegetation jeder Bodenart als ein einheitliches Ganzes zu betrachten. Diess umso mehr, als die

¹ Zu vergleichen mit den englischen "Downs," welche gewiss vom prähistorischen Menschen besiedelt waren. [Ed., NEW PHYT.]

verschiedenen Bodenarten auch gleichzeitig physiographische Einheiten bilden: Lehm, Ton und Sand in den Niederungen, kieselreicher Boden mehr auf Hügeln (Crampton). Bemerkenswerterweise lässt sich auch ein solcher Parallelismus zwischen der geologischen Unterlage und den Schafrassen erkennen (O'Connell, *Agricultural Geography*). Diese durch Boden und Sukzession zusammengehaltenen Assoziationen nennen die englischen Phytogeographen eine "Formation." Ueber die Berechtigung dieser Bezeichnung kann man verschiedener Ansicht sein--dass aber die durch sie zusammengefassten Vegetationen zusammengehören, ist ausser Zweifel. Dabei muss gegenüber einer auf offenkundigem Missverständnis beruhenden Kritik betont werden, dass die in den "Types of British Vegetation" unterschiedenen Formationen "auf Lehm und Ton," "auf kieselreichen Böden," "auf Sandstein" nur für das untersuchte Gebiet gelten; es wird keinem englischen Pflanzengeographen einfallen, einen tropischen Urwald auf kieselreichem Boden mit den englischen Eichenwäldern in einer "Formation" zusammenzufassen!

Ganz anders war die Waldgeschichte im schweizerischen Mittellande: hier haben die wechselnden wirtschaftlichen Bedürfnisse, in neuerer Zeit unter der Führung einer intensiven Forstkultur die Zusammensetzung des Waldes stark verändert und die ursprünglichen Beziehungen verwischt.¹

Im Mittelalter wurde der Wald ebenso sehr als Weide wie als Holzlieferant benutzt; das führte zu einer Bevorzugung der Eiche, die ja auch Eicheln zur Schweinemast liefert. Unter dem Einflusse des grösseren Holzbedarfes und einer geregelten Forstwirtschaft, welche die Weide aus dem Wald verbannt, wird später die Eiche zurückgedrängt, die Buche begünstigt und schliesslich die Fichte, welche im schweizerischen Mittellande ursprünglich nur spärlich vorhanden war, durch ausgedehnte Reinanpflanzung an Stelle des Laubwaldes gesetzt. In neuester Zeit kommt die Forstwirtschaft von der Reinpflanzung der Nadelhölzer ab und wendet sich wieder mehr den natürlichen Mischwäldern zu. Es ist aber klar, dass durch die starken früheren Eingriffe das ursprüngliche Waldbild ganz verändert wurde.

So zeigt sich die Geschichte der englischen Wälder grundverschieden von der der unsrigen. Aber auch im Verhalten des *Graslandes* finden sich bedeutende, besonders wirtschaftliche Differenzen. Wohl sind die Schweiz und Grossbritannien diejenigen

¹ vgl. H. u. M. Brockmann-Jerosch, "Die natürlichen Wälder der Schweiz." Berichte d. schweiz. bot. Ges. XIX, 1910.

Länder Europas, die den grössten Prozentsatz des bebauten Landes der Produktion von Viehfutter widmen: in der Schweiz sind es 40% der Gesamtfläche, 77% des produktiven Areales, in Grossbritannien schwankt der Anteil des Graslandes an der Totalfläche von 50·4 (England) bis 76·1% (Wales), an der produktiven Fläche von 56% (England), bis 78% (Wales). Beide Länder sind von der Natur prädestinierte Grasländer¹ und in beiden spielt die Viehzucht eine Hauptrolle.

Aber die Natur des Graslandes ist grundverschieden: in der Schweiz herrscht im Hügelland und bis hinauf zur Koniferenstufe intensive Mähewirtschaft vor, welche durch starke Düngung oder Ansaat vom ursprünglichen Rasenbestand total verschiedene Assoziationen schafft; die extensiv betriebenen Weiden mit ihrem zwar auch stark trivialisierten, aber doch etwas mehr dem ursprünglichen Zustand sich nähernden Rasen, sind im Wesentlichen auf die subalpine und alpine Stufe beschränkt, wie es für ein Gebirgsland die natürliche Folge der klimatischen und Verkehrsverhältnisse ist: die Höhen liefern das Sommerfutter, die tiefen Gelände das bei der durch den Winter gebotenen Stallfütterung notwendige Winterfutter.

In Grossbritannien ein ganz anderes Bild: neben bedeutendem aber seit 1868 steigend reduziertem Getreidebau (siehe oben!) herrscht auch in der Ebene die extensive Weidewirtschaft, (welche am wenigsten Arbeits- und Kapitalaufwand fordert), meistens auf reinem Grasland, in grossen Parken und auf länderechten artenarmen Heide- und Moorstrecken betrieben, bedingt durch die niedrigen Preise für landwirtschaftliche Produkte und begünstigt durch das Pachtssystem² auf Latifundien (87% des landwirtschaftlich benützten Bodens in England bestehen aus Pachtungen!), ferner durch den milden Winter, der es erlaubt, Grossvieh und Schafe fast das ganze Jahr hindurch weiden zu lassen. Deshalb ist auch die Heuwirtschaft in Grossbritannien relativ schwach entwickelt: es wird oft nur *ein*

¹ Und in beiden hat seit Mitte des letzten Jahrhunderts die Graswirtschaft gewaltig zugenommen: in ganz Grossbritannien (siehe Brinkmann, *Die Grundlagen der englischen Landwirtschaft*, Hannover, 1909) sank der Anteil des Ackerlandes an der produktiven Fläche von 1868 bis 1906 von 51·4% auf 41·5% und stieg umgekehrt die Weidefläche von 48·6% auf 58·5%; dieser Prozess war wie in der Schweiz eine Folge der Getreidekonkurrenz des Auslandes.

Also in England. The great fall in prices resulting from the extensive importation of foreign wheat as a result of the removal of import duty has now been checked, the price of English wheat has risen, and a good deal of permanent pasture is again coming under the plough. [Ed., *NEW PHYTOLOGIST.*]

² Doubtful if the leasehold system has this effect [Ed.]

Schnitt genommen, die weitere Nutzung geschieht dann als Weide in den meisten Fällen erfolgt der Schnitt "unter dem Vieh weg" (Brinkmann). Ueppige Fettwiesen wie sie besonders in der Region der Tauchewirtschaft bei uns vorkommen, sahen wir in England nirgends. Dagegen ist der Feldfutterbau stark entwickelt.

Ein floraverändernder Faktor dagegen, der bei uns völlig fehlt, und der wenigstens lokal in Grossbritannien stark wirkt, sind die Kaninchen, welche den Rasen stellenweise förmlich scheeren und nur dornige oder sonst geschützte Arten stehen lassen, u.a. *Carduus crispus* und *Senecio Jacobaea*, die dann im Herbst grosse Bestände bilden. Auch auf die natürliche Verjüngung des Waldes haben sie Einfluss, indem sie die Keimpflanzen wegfressen.

Gegenüber diesen die Flora verändernden Faktoren steht ein die natürliche Vegetation erhaltendes Moment, das bei uns gänzlich fehlt: die ausgedehnten für die Jagd reservierten Gelände, für die keine andere Nutzung besteht! Die "Forests" in England, die meisten Mittelwälder und ausgedehnte Heide- und Moorflächen im Norden Englands und in Schottland (die als "Grouse-moors," dem schottischen Schneehuhn als Gehege dienen) gehören hieher.

Zu diesen weiten Flächen landwirtschaftlich unbenutzten Bodens kommen noch die ausgedehnten, höchstens als Streu benutzten *Pterideten*, an Stelle degenerierter Wälder auf kalkarmem Boden im Norden und Westen Englands und in Schottland in enormer Ausdehnung auftretend. Auch die weiten Hänge der "Pennines" mit magerem Grasland auf kalkarmen Boden werden wirtschaftlich fast nicht benutzt.

So sehen wir zu unserem Erstaunen in dem dichtbevölkerten England enorme Strecken extensiv oder gar nicht bewirtschafteten Bodens, in starkem Gegensatz zu der intensiven Bodenbenutzung unseres schweizerischen Mittellandes.

3. Beim Vergleich der subalpinen und *alpinen* Vegetationen der schottischen Hochländer, die wir auf Ben Lawers (1220^m) kennen lernten, mit ihren biologischen Aequivalenten in den Schweizeralpen ergeben sich etwa folgende Hauptdifferenzpunkte:

(a). In den unteren Lagen (unterhalb der Baumgrenze, in der Stufe der "Weide und des geschlossenen Moorlandes" von Smith) sind die schottischen Berge weit monotoner, von ausgedehnten artenarmen zusammenhängenden Moor- und Weideflächen bedeckt (bei Ben Lawers vorwiegend Grasland, sonst meist Heide und Moor), während bei uns Wald, Wiese, Weide, Moor, Geröllflächen, und Felsabstürze, viel mannigfaltigere Vegetationsbedingungen bieten.

Das Fehlen der Sennhütten steigert noch die Monotonie der Landschaft denn eine eigentliche "Alpwirtschaft" gibt es nicht; die Milchwirtschaft tritt gegenüber der Aufzucht zurück.¹

(b). Die Entwaldung ist weiter vorgeschritten als in unsrern Bergen: am Hang von Ben Lawers fehlt der Wald völlig mit Ausnahme einiger angepflanzter Gehölze von *Pinus* und *Larix*.

(c). Die Baumgrenze liegt in den Grampians bei c. 600^m (610-620^m nach Hardy, 640^m am Ben Nevis nach Berghaus). Die Grenzbäume in den schottischen Hochländern sind *Pinus sylvestris* var. *scotica* E.u.H. und *Betula tomentosa* Reitt.u.Abel, wobei nach W. G. Smith (brieflich) *Pinus* meist die obere Waldgrenze bildet. *Pinus sylvestris* hat ihre obere Grenze in den Schweizer Alpen einerseits bei 1300^m (Nordalpen) anderseits bei c. 2300^m (Puschlav, Südalpen nach Brockmann); ersteres ist die durch Schneedruck leidende typische Form, letztere die dem Schneedruck gut widerstehende alpine Rasse *engadinensis*. Mit welcher der beiden wir die schottischen Vorkommnisse zu vergleichen haben, ist unsicher. Lassen wir also *Pinus* aus dem Spiel! *Betula tomentosa* geht in den

¹ W. G. Smith schreibt mir darüber freundlichst folgendes:

"Man kann mit Sicherheit behaupten, dass Alpwirtschaft desshalb auf unsrern Hochländern unmöglich ist, weil das Grossvieh dort nicht grasen kann, wo das schottische Schneehuhn und das Rotwild gehegt wird. Es gibt nur sehr wenige Gegenden unserer Hochlande, wo nicht das eine oder andere dieser Jagdtiere gehegt wird, denn wo diess möglich ist, bringen sie dem Landeigenthümer grösseren gewinn als Grossvieh oder Schafe. Folgender Ausspruch stammt von einem erfahrenen Grossgrundbesitzer in d. Hochlander, Lord Lovat ("Afforestation in Scotland," Vol. XXV, Transactions Royal Scottish Arboricultural Society, 1911). 'In Glen-More (in der Nähe des Caledonischen Kanals) ergab die Schafweide selbst in der besten Periode der Schafhaltung nicht einmal 1/5 des Ertrags, den dasselbe Land jetzt als Rotwildgehege abwirft.' An einer andern stelle sagt er: 'Mittleres Rotwild-Land wirft per Jahr 1-3 shillings per Acre (0-4 Hectar) ab; Schneehuhn-Gehege 1-1½ shillings, Schafsömmierung 1-3 pence.' In diesem Werk über die Aufforstung von Gebirgsländern wird das Grossvieh kaum erwähnt, während die Schafweide häufig berührt wird, ein Beweis für die Richtigkeit meiner obigen Behauptung.

"Aber ich glaube, dass im 18. Jahrhundert das Grossvieh auf die höher gelegenen Weiden getrieben wurde. Ich habe das in Werken aus jener Zeit gelesen; und es ist allgemein bekannt, dass vor etwa 150 Jahren die Schafweide in d. Hochlander enorm zugenommen hat, und sich seither erhalten hat, obwohl in den letzter 60-70 Jahren die Schneehuhn-Moore und Rotwild-Gehege zugenommen haben. Wir haben auch richtbare Beweise dafür, dass das Vieh früher dort oben weidete, denn hin u. wieder findet man in d. Bergweiden zerstreut sogenannte "Shielings," kleine roh gemauerte Hirtenhütten, die jetzt zerfallen sind. Und in Lawers village sagte man mir, dass man früher das Grossvieh auf d. höhern Weiden sömmerte. Doch waren das zweifellos nur junges Mastvieh (stirks); Käse u. Butter wurde dort oben nicht fabrizirt."

Nordalpen bis 1600^m (Wartman u. Schlatter), in den Centralalpen (Berninagebiet) bis 2050^m (Rübel), im Ofengebiet bis 2120^m (Furrer, briefl. Mittl.).

Es ist schon seit Wahlenberg bekannt, dass das ozeanische Klima die polare Baumgrenze nach Süden verschiebt; neuerdings hat Dr. Brockmann-Jerosch in zwei sehr bemerkenswerten Abhandlungen auch die Depression der *vertikalen* Baumgrenze durch ozeanisches Klima behandelt.¹ Nach allgemeiner Ansicht steht die Baumgrenze in Schottland tief; der Vergleich mit den Alpen und den deutschen Mittelgebirgen spricht dafür.

Verweilen wir einen Augenblick bei dieser Frage!

Ob die Quote von 600^m als eine relativ tiefe zu bezeichnen ist, ist schwer zu entscheiden. Denn der Vergleich der Baumgrenzen verschiedener Gebirge ist eine komplizierte Frage. Vergessen wir nicht, dass eine bestimmte Baumgrenze in vergletschert gewesenen Gebieten kein physikalisch-meteorologisches, sondern ein physiologisch-historisches Problem ist: es ist diejenige Grenze, die ein bestimmter, unter den auslesenden Bedingungen der postglacialen Zeit in das betreffende Gebirge eingewanderter Baum unter den gegenwärtigen Bedingungen durch seine ganz bestimmten oekologischen Eigenschaften zu erreichen im Stande ist. Ein Vergleich zweier Baumgrenzen ist, streng genommen, nur dann gestattet, wenn sie vom gleichen Baum gebildet werden; und selbst dann ist die Möglichkeit nicht ausgeschlossen, dass der Unterschied in der erreichten Höhe auf einer differenten oekologischen Anpassung beruht (dass zwei geographische "Rassen" vorliegen, wie bei *Pinus sylvestris*). Dann muss entschieden werden, ob die jetzige Baumgrenze eine natürliche ist oder nicht; und wenn eine ehemalige höhere Grenze, wie das in den schottischen Hochlanden und in den "Pennines" der Fall ist, aus Baumrelikten im Torf konstatiert werden kann.² So taucht die Frage auf: ist diese ehemalige höhere Grenze durch klimatischen Faktoren bedingt (wie Lewis und Crampton annehmen) oder ist die jetzige Depression eine anthro-

¹ Siehe Brockmann-Jerosch "Der Einfluss des Klimacharacters auf die Pflanzengrenzen," Bericht über die 10. Zusammenkunft der freien Vereinigung der Systematiker und Pflanzengeographen in Freiburg i/Br., 1912. Engler's botan. Jahrbücher, 1912.

Und Brockmann-Jerosch und Rübel, "Die Einteilung der Pflanzengesellschaften nach oekologisch-physiognomischen Gesichtspunkten," Leipzig, 1912, bei W. Engelmann.

² In den Penninen wurde Birke und Erle in 745^m gefunden, in Schottland Birke und Kiefer bis 1000^m (Lewis); nach Hardy ist in Schottland eine Depression der Baumgrenze von 150-200^m zu konstatieren.

pogene Erscheinung (wie die Mehrzahl der englischen Phyto-geographen glaubt) oder vielleicht lokal durch Facieswechsel bedingt (Absterben der Bäume durch Aufwachsen des Torfs).

Zum Vergleich des Klimas der schottischen Hochlande mit dem der Alpen möge hier eine kleine Tabelle über die klimatischen Daten der Gipfelstation des *Ben Nevis*, des *Pilatus* (mit ähnlicher mittlerer Jahrestemperatur) und des *Gäbris* im Kanton Appenzell (von ähnlicher Höhe) folgen:—

1. *Ben Nevis*, bei $56^{\circ}48$ NB; $5^{\circ}8$ WL; 1342^m ü.M. (20 Jahre-beobachtet).¹

2. *Pilatus*, bei $46^{\circ}59$ NB; $8^{\circ}16$ EL; 2068^m ü.M. (schweiz. nördl. Kalkalpen,² 10 Jahre).

3. *Gäbris*, bei $47^{\circ}23$ NB; $9^{\circ}20$ EL; 1250^m ü.M. (schweiz. Molasse-Voralpen,³ 20 Jahre).

	BEN NEVIS.	PILATUS.	GÄBRIS.
Mittlere Jahrestemperatur	... -0·3 ...	... +0·3 ...	... +5·1 ...
Januar-Mittel	... -4° ...	... -6·2 ...	... -1·9 ...
Juli-Mittel	... +5° ...	... +8·1 ...	... +13·4 ...
Mittlere Jahresextreme	-13·8; +16·5	-25·2; +22·6	-15·6; +25·2
Mittlere Jahresschwankung	...	...	...
Diff zw.Jan.u.Julimittel	... 9° ...	... 14·3 ...	... 15·3 ...
Jährl. Niederschlag	... 4084 ^{mm} ...	... 1393 ^{mm} ...	... 1336 ^{mm} ...
Zahl der Tage mit Niederschlag	... 267·2 ...	... 167·1 ...	... 150·7 ...
Nebelfreie Tage	... 114 ...	... 225·6 ...	... 258·7 ...

Das Klima des c. 10° nördlicher und c. 12° westlicher gelegenen, *Ben Nevis* ist also gegenüber dem des ungefähr gleich hohen *Gäbris*-Gipfels ausgezeichnet durch:—

- eine um $5·4^{\circ}$ niedrigere mittlere Jahrestemperatur,
- ein um $2·1^{\circ}$ niedrigeres Januarmittel,
- ein um $8·4^{\circ}$ niedrigeres Julimittel,
- eine weit geringere Jahresschwankung (9° gegen $15·3^{\circ}$),

¹ Siehe: Obermayer, Ad., *Zwanzig Jahre meteorolog. Beobachtungen auf dem Ben Nevis. Jahresbericht des Sonnblick-Vereins für d. Jahr 1906*, Wien 1907.

² Buchan and Omund, *the Ben Nevis Observations, 1893—1897. Transact. of the R. Soc. of Edinburgh*, Vol. XLIII, 1905.

³ Maurer, Billwiller u. Hess, *Das Klima d. Schweiz.*, 1910, Bd. II.

eine weit grössere Niederschlagsmenge,
viel häufigere Nebelbildung.

Fügen wir noch hinzu, dass der Wind häufig und heftig ist (nur 114 Kalmen und eine mittlere Windstärke von 6·5 Sekundenmetern wurden beobachtet), dass die wirkliche Sonnenscheindauer nur 16% der möglichen beträgt, der Schnee gewöhnlich von Mitte November bis Juni liegt und im April eine mittlere Höhe von 213^m zu erreichen pflegt: so bekommen wir einen Begriff von dem Nebel-, Regen-, Schnee- und Sturmreichen, Sonnenarmen ozeanischen Klima der schottischen Hochlande.

Wenn wir die jetzige Baumgrenze der *Betula tomentosa*, die am Ben Nevis bei c. 640^m liegt, auf ihren thermischen Wert hin mit der Birkengrenze in den Schweizeralpen vergleichen, so kommen wir zu folgendem Resultat:

Am Ben Nevis macht *Betula tomentosa* gegenwärtig bei einer mittleren Julitemperatur von 9·75°C Halt,¹ während sie bei uns in den Nordalpen (1600^m Murgtal, Curfürsten) bei einer Julitemperatur von 10° (von Glarus aus berechnet), ihre Grenze erreicht; in den Zentralalpen liegt die Grenze im Berninagebiet bei 2050^m, entsprechend einer Julitemperatur von 10°, von Sils Maria aus berechnet; im Ofengebiet liegt sie bei 2120^m, was einer Julitemperatur von 9·67° entspricht, von Schuls aus berechnet. Am Ben Nevis erreicht also heute die *Betula tomentosa* ihre obere Grenze unter nahezu gleichen Temperaturbedingungen des wärmsten Monats wie in den Alpen. Richtiger wäre der thermische Vergleich, wenn wir die Mitteltemperaturen der *Vegetationsperioden* vergleichen könnten, aber wir kennen die Dauer derselben für die Birke an ihrer oberen Grenze nicht, und müssen desshalb als ungefähren Maßstab derselben den wärmsten Monat nehmen.

Die Birke macht also am Ben Nevis bei ungefähr denselben Mitteltemperaturen des wärmsten Monats Halt, wie in den Alpen; die so verschiedene Quote ihrer oberen Grenze (640^m Ben Nevis, 1600^m Nordalpen, 2050^m bis 2120^m zentrale Massenerhebung der Alpen) liegen bei annähernd derselben Mitteltemperatur des Juli (unter Berücksichtigung der ehemaligen höhern Grenze in den schottischen Hochlanden sogar bei einer tiefern Julitemperatur, was einer Hebung der Grenze gleichkäme, wenn das Klima gleich geblieben ist).

¹ Julitemp. in Fort William 13·9°C, in Ben Nevis 5°C, Höhendifferenz 1333^m, macht 0·66° Abnahme der Julitemperatur pro 100^m; in den Alpen rechnet man im Mittel 0·65° pro 100^m.

Während aber in den Grampians diese Birkengrenze gleichzeitig der Baumgrenze entspricht, liegt im Berninagebiet die mittlere Baumgrenze (Lärche und Arve bis 2300^m) noch 250^m weiter oben, also bei einer mittleren Julitemperatur von nur 8°; im thermischen Vergleich mit den Zentralalpen ist also die Baumgrenze am Ben Nevis um 250^m niedriger, um 300^m im Vergleich mit den Nordalpen. Es wäre zu untersuchen, ob nicht mit Hilfe der Lärche, die in Schottland trotz ihrer sonstigen continentalen Allüren vortrefflich gedeiht, die Baumgrenze in den schottischen Hochländern höher getrieben werden könnte.

Die obigen Ausführungen beweisen die Komplikation des Problems und rufen einer Untersuchung darüber, ob nicht die die Baumgrenze deprimirende Wirkung des ozeanischen Klimas vorwiegend oder ausschliesslich auf der Herabsetzung der Temperatur der Vegetationsperiode beruht, und ferner darüber, in wie weit historische und Concurrenz- Factoren durch Einwanderungshinderung hochsteigender Bäume die Grenzfrage beeinflussen. Doch kann hier darauf nicht weiter eingegangen werden.

(d.) Die alpinen Formationen sind weit weniger mannigfaltig als in den Alpen; als geschlossene Formation wird nur "alpines Grasland" zitiert, als offene die Felsflora ("arctic-alpine chomophyte Formation of crags and corries") und die Flora des tiefgründigen und durchlässigen Bodens auf verwitterten windgefeigten Gipfelplateaus (eine vorwiegend *klimatische* Formation).

Es fehlen unsere alpinen Strauchgürtel; es fehlen Äquivalente für unsere Alpenrosen, Alpenerlen und Legföhren; es fehlen die üppigen Hochstaudenfluren geschützter humusreicher Stellen; es fehlen analoge Bestände wie diejenigen von *Carex curvula* und *firma*. Dagegen fanden wir auf dem Gipfelplateau des Ben Lawers in typischer Ausbildung die "Schnetälchenvegetation," die seither von W. G. Smith¹ von dort in ausgezeichneter Weise beschrieben worden ist. Von ihren konstanten schweizerischen Konstituenten fehlt *Arenaria biflora*, *Cardamine alpina*, *Chrysanthemum alpinum* und *Alchemilla pentaphyllea*, die ersten zwei arktisch, die letztern mittel-europäisch-alpin.

Dem alpinen Grasland, zu dem auch noch heideartige Vegetationen mit *Vaccinium myrtillus* und *uliginosum* gerechnet werden, fehlt der schöne Schmuck unserer sämtlichen Gentianen aus der Gruppe Coelanthe (*lutea*, *purpurea*, *pannonica*, *punctata*, *Kochii*, *Clusii*, *angustifolia*, *alpina*), ferner *bavarica*, *imbricata*,

¹ W. G. Smith, Scottish Botanical Review, 1912, pp. 81-89.

brachyphylla, auch die alpinen Anemonen, *Pedicularis*, *Primula* (excl. *farinosa*), *Androsace* vermissen wir.

Subalpines und alpines Grasland und die Vegetation der Gipfelplateaus werden bei näherem Studium noch manche typische Assoziationen aufweisen, ausser den bis jetzt einzige hervorgehobenen *Racomitrium*-Heiden und Schneetälchen.

4. Die Flora Grossbritanniens ist im grossen Ganzen als eine verarmte mittel- und westeuropäische Flora zu bezeichnen, mit schwachem Einschlag südeuropäischer und amerikanischer Elemente und mit relativ starkem arktischem Einfluss, ohne ausgesprochenen insularen Charakter und mit schwachem Endemismus, der nur durch leichte Flexion der Formen angedeutet ist. Bei der vorgeschrittenen geologischen Reife ("mature physiography" nach Crampton) des Landes überwiegen stabile, ausgeglichene geschlossene, artenarme Pflanzenformationen auf weiten Strecken: Moor, Grasland, und Heide, welche grösstenteils als sekundäre Halbkulturformationen dem in ausgedehntestem Maasse zerstörten Wald gefolgt sind. Durch den Einfluss des Beweidens, lokal auch der Kaninchen, sind diese Bestände trivialisiert und die Unduldsamkeit der herrschenden Arten verhindert erfolgreiche Invasion neuer Formen. *Juncus squarrosus*, *Nardus stricta*, *Eriophorum vaginatum*, *Trichophorum cæspitosum*, *Calluna vulgaris*, *Pteridium aquilinum*, herrschen in reinem Schluss auf länderweiten Strecken ebenen oder welligen Bodens. Dazu kommen noch historische verarmende Momente: die relativ geringe Ausdehnung des eisfreien Refugiums im Süden und Südosten Englands während der letzten Glaciation und die Schwierigkeiten der postglacialen Einwanderung über Meer.

Aber trotz dieser Artenarmut bot uns Kontinentalen und besonders den binnennördlichen Alpenbewohnern unter ihnen die Vegetation Grossbritanniens eine Fülle des Interessanten und Schönen: Die herrlichen Verlandungsbilder und die wilden Bruchwälder ("Carr") in den Broads, die so klaren Sukzessionen auf den marinischen Schotterbänken und Salzsümpfen, die Waldbilder und Graslandtypen in den Tälern der Penninen, die stundenweiten ungeheuren *Eriophorum*-Moore, die ökologisch so verschiedenen Typen der *Pteridieten*, die Besiedelung und Fixierung der Wanderdünen in Southport, den wunderbaren Baumwuchs von Dunkeld mit seinen säkulären Lärchen, die reiche Wasserflora der "Lochs", die Eichen-Birken-Wälder der "Trossachs" mit ihren üppigen *Hymenophyllum*-Teppichen, die beinahe subtropischen Wälder

Killarneys mit ihrem *Arbutus*, die Heiden und Bergmoore West-Irlands mit ihren amerikanischen Elementen, die typische Glacial-landschaft, die wir von Urrisbeg bei Clifden überblickten, mit ihrer alle Berge überziehenden Vermoorung und ihren leuchtenden *Ulex-Gallii*-Heiden, die Algenzonen auf den Strandblöcken bei Galway, die cornwallische Heide im jauchzenden Blüten-schmuck ihrer *Erica vagans*, die einzig dastehenden Taxus-Wälder der "Downs" und endlich die mannigfaltigen Wunder, welche ein extrem ozeanisches feuchtes Klima zu Stande bringt: die Verwischung der Höhenunterschiede, so dass *Dryas* und *Adiantum Capillus Veneris* beieinander wachsen, und die reichen Verwildерungsgelegenheiten und unbegrenzten Kulturmöglichkeiten empfindlicher Exoten, wie wir sie namentlich in den Gärten der Herren Beamish und Williams bewunderten.

In der Tat, internationale phytogeographische Exkursionen müssen nach diesem vollen Erfolg des zweiten¹ derartigen Unternehmens ein ständiges Bildungs- und Verständigungsmittel der Pflanzengeographen werden: auf Wiedersehen also an der dritten Exkursion¹ in Nordamerika!

¹ Professor Schröter calls the British Phytogeographical Excursion the *second* international excursion, since he claims, with some justification, the Swiss excursion (in connexion with the International Geographical Congress at Geneva in 1908) which he led so ably, and which inspired the initiation of the British Excursion (see p. 2), as the *first* international excursion of its kind. [ED., NEW PHYTOLOGIST.]

X1.—ADDITIONAL FLORISTIC NOTES.

BY G. CLARIDGE DRUCE.

(Oxford).

IN the preceding chapters devoted to this subject, which have appeared in the NEW PHYTOLOGIST, our foreign *confrères* have dealt with the salient features of our delightful excursion in a most interesting manner. In one of them (Ch. V) Dr. Rübel, in his suggestive note on the Killarney vegetation, names the Violet we gathered there as *V. silvestris* var. *pseudo-mirabilis*, while Dr. Ostenfeld (Ch. VI) in a masterly manner gives details of some of the critical forms noticed on the expedition, and names some new forms for Britain. Dr. Graebner (Ch. VII) in his valuable paper mentions *inter alia* some of the plants which have become naturalised in Britain, while Professor Drude (Ch. IX) in his erudite and thoughtful “Comparison of the Flora of Great Britain with that of Central

Europe" gives us many themes for thought, not only from an ecological but from a systematic standpoint.

My own earlier notes (Ch. III) were published so soon after the excursion, that in some cases the names given were only provisional, and many more had to be submitted to the fire of criticism, but in no case was any dogmatic statement made. One is too conversant with the variability of nature, and too cognisant of one's own imperfect knowledge to give hard and fast definitions or to refuse to recognise that a plant may be looked at from more than one point of view—the characters on which one authority relies for definition are not always those which another chooses—so that when one is dealing with some of the plastic species, it is quite evident that discordant opinions may result. It is sufficiently obvious that a number of botanists drawn from a wide area in Europe would have different systems of nomenclature, and would take divergent views as to the limitations of species and the lower grades into which plants have been divided. Yet on the whole it was rather the general agreement, than the instances of difference which impressed me. One fact, however, stood out as a prominent feature, namely that whereas many leading British systematists have been extremely reluctant to acknowledge that the British Isles contained endemic species—for instance Sir J. D. Hooker in the preface to Wallace's *Island Life*, where the suggested endemic species were almost entirely rejected, either as not being endemic or as not being species. Yet, as one would expect, a more minute and critical study of plant forms, especially by observers working in the field, rather than in herbaria—since in the latter one only sees a specimen or two and not the group, sees it only in part and not as a living entity, so that the field student is able to notice many points of difference, some so minute as to elude our power to adequately define, and yet other variations which can not only be seen but described—has led to well-marked differences being established between many of our island species and their homologues on the mainland of Europe. Drude (pp. 78-79) well says "very many common species constantly polymorphic in their German stations appear to me to look very different in England, to represent in fact slightly differentiated examples of local endemism. How otherwise can we interpret the Birches for instance? . . . I may say that I gained the impression of numerous slightly differentiated local forms, endemic in England." For an example of this local endemism attention may be directed to so well known a plant as our Golden Stonecrop, which in Britain

we have called *Sedum acre*. Our Swiss and German *confrères* felt certain when they saw it growing in Lancashire, Westmoreland and Galway that it was not identical with the Continental *acre*. My friend Professor Graebner took it home and has grown it side by side in the Berlin garden with the German *acre*, and finds it differs in all its points. He writes " *Sedum Drucei* (ined.) belongs to quite a large number of forms endemic in Britain which last year were observed, . . . and which took quite the foremost place of interest. This group proves beyond a doubt that the flora of the British Isles in consequence of the early separation from the Continent possesses a far larger geographical individuality, and has received a less disturbed development than is found in the floras of other parts of Northern Europe." This statement is borne out by one's own experience; one sees that the common species of Jersey have a different facies from those of our Midlands, while those of the north Scottish coast possess a distinct individuality from those of Devon or Kent. But it is only exceptionally that *specific* distinctions can be found. This range of variation, differing necessarily in degree, however suggests that we may be unwise when working with critical forms to attempt to identify the micro-species of *Geranium*, *Erodium*, the *Melanium* Violas and the critical species of *Rosæ*, *Euphrasiæ*, *Hieracia*, and *Taraxaci*, with continental names. In many cases I strongly suspect that the British plants are sufficiently distinct to warrant them being described and named. Indeed, as will be seen, two of our British plants, *Erigeron alpinus* and *Melampyrum pratense*, should bear, Dr. Ostenfeld suggests, other names. And if evolution be a fact, we might be prepared to expect these plants, living for so long under different climatal conditions and geographical position, should have evolved a facies of their own.

With the editor's kind permission I purpose giving a short resumé of some additional facts which have been obtained since the publication of my paper, to correct a few errors, and to avail myself of the opportunity of thanking my foreign *confrères* for their very great kindness and assistance in answering many questions, and for the manner in which they received the avowedly imperfect paper which dealt with the botanical gatherings made during that memorable excursion.

The number prefixed to the species is that given in my *List of British Plants*. When a species or variety is put in heavy type, it means either that it is new to the British flora or that the name is new. An asterisk (*) before a name means that the plant is alien. The sign X means a hybrid.

20. *Ranunculus acris* L. On Crossfell a Buttercup occurred which I think must be referred to *R. acris* var. *Nathorstii* (Berl.), Druce, Ann. Scot. Nat. Hist. (1900) 166. I think it is the same as the large flowered Ben Lawers plant, gathered by me in 1897, and which Herr Freyn named *R. Nathorstii* A. Berlin in Öfvers. af K. vet.-Akad. Forhandl., (1884), N.7, pp. 20-21, a reference which I have been unable to verify. Dr. Graebner has grown it at Berlin, and finds it keeps its characters. It is the first record for England. But, as Freyn says, our *Nathorstii* does not exactly agree with the East Greenland plant, for the shape of the leaves is not quite the same. The carpels have a long beak.

48. *Caltha palustris* L. The small creeping form of this plant, which is the var. *minor* DC. of my *List*, was gathered by Dr. Graebner on Crossfell, and this also retains its character in culture and keeps quite distinct he says from *C. radicans* Forst.

77c. *Castalia alba* var. *occidentalis* Ostenf. in NEW PHYT., p. 116, 1912, under *Nymphaea* vel *Castalia*. By this name Dr. Ostenfeld now describes the plant which he showed us in Perthshire and then thought to be *Nymphaea candida* (NEW PHYT. (1911), 307) as also the plants gathered in Co. Galway. They would have been passed by me for *C. alba* var. *minor* (DC.), but Dr. Ostenfeld shewed us certain characters which separated them, he thought, from *alba* and induced him to name them *candida*. But as I pointed out (p. 308), *candida*, which I only knew from description, is itself a very critical and variable plant and in some parts of Germany where *C. alba* and *candida* grow together the two forms are with difficulty separated. Even in Dr. Ostenfeld's figure of our British plant the section of the ovary appears to be nearer to *candida* than to *alba*. I may also say that after I wrote my paper, on examining the pollen of our plants under a $\frac{1}{4}$ -inch objective with that of *candida* with which I had been supplied, I found that it did not agree. We may therefore accept Dr. Ostenfeld's identification as being probably correct. Whether it is distinct from *minor* DC. has yet to be shewn, but it is quite likely a different form, and, perhaps, as Dr. Ostenfeld suggests, a plant of "acid-humus" habitats, whereas *alba* is found in more basic water. I saw it this year near Llanberis in Carnarvonshire, and although I was not able to gather it, almost certainly the same form was on the Moor of Rannoch.

In the *Flora of Hampshire*, p. 19, 1904, there is a reference to *Nymphaea alba* minor as occurring in 1739: "in these pools I observed to grow (between Lyndhurst and Brockenhurst) both the small and great Water Lily; they were in blossom together, so that the distinction was easily made, and the difference was pretty remarkable," and I have noticed the same form in Virginia Water, Surrey and Berks. It will be interesting to see if these are distinct from Dr. Ostenfeld's variety. We may add that Caspary, an acknowledged authority on Water Lilies, treated *candida* as a variety of *N. alba*, and many authors consider it only a sub-species.

294. *Viola Riviniana* Reichb. var. *pseudomirabilis* (Coste) Gregory. This is the plant described by Dr. Rübel (p. 55) as *V. silvestris* var. *pseudomirabilis*, but more correctly placed as above by Mrs. Gregory in her *British Violets* (1912) under the above species. Coste (Bull. Soc. Bot. Fr. XL. (1893), p. CXV described it as a species while Becker (*Mon. Violae*, p. 12, 1910) treats it as a hybrid of

Viola mirabilis and *V. Riviniana*, the former species not yet recorded from the British Isles.

327. **Gypsophila porrigens* Boiss. Alien with other Eastern species Galway bay, kindly named for me at Kew.

403 (2). *Sagina scotica* Druce in Rep. of Bot. Exch. Club (1911) 14 April, 1912. This is the Ben Lawers plant which in my paper (p. 26) I named *S. glabra* Fenzl. var. *scotica*; but even before the paper was printed I had seen that it could not be put under that species, since the Tirolean specimens with which I had compared it were, I found, not authentic. The petals of *S. glabra* are much longer than ours, besides other marks of distinction. This was borne out by specimens of true *glabra* kindly sent me by Prof. Schroeter. Dr. Ostenfeld identifies it as *Sagina procumbens* × *saginoides*—*S. media* Brügg (but with a wrong synonym—it should read *S. glabra* var. *scotica* Druce, not *S. glabra* Druce). This was his view at the time, and although strongly controverted by one or two of our *confrères* has some probabilities in its favour, though I think he places too much stress on the supposed barren condition of the plants. But its great abundance over considerable areas, its different flowering time, and to me the absence of evidence of the presence of *saginoides* in it led me to adopt Prof. Graebner's view that it was a distinct plant, which I have named *scotica* in the work cited above. Since doing so Prof. Graebner writes (July 8th, 1912) "the *Sagina* from Ben Lawers grows very well, it has flowers and well developed ripe fruit. It is right to take it as a species; it is very characteristic and cannot be a hybrid," and on August 21st "it is impossible that *S. scotica* is a hybrid! we cultivate it with *saxatilis* (*saginoides*), but I cannot find anything of this plant in *S. scotica*. It is without doubt near *procumbens*, but a quite different plant. It has had good fruits." In culture I find that it produces good seed, and although reverting in appearance towards *procumbens*, still I think keeps distinct. In my paper I suggested that it would prove to be often named *saginoides* (or by one of its synonyms) in herbaria, and I find quite a considerable portion of Scottish *saginoides* to be really *scotica*. It exists under that name in Babington's Herbarium. The acute botanist, Mr. Webb, had also in *Herb. Edin.* first labelled specimens of it *S. saxatilis* and subsequently thought it to be *S. procumbens*, while there are other specimens under *saginoides* on various sheets. *S. scotica* is not confined to Ben Lawers, for I have seen it from Craig Chailleach in Mid Perth; from Glen Callater, S. Aberdeen, and from Clova, Forfar; a distribution itself somewhat antagonistic to its being of hybrid origin.

488. *Geranium Robertianum* L. var. *Villarsianum* (Jord.). Dr. Ostenfeld (pp. 57-58) believes the forms he collected in the west of Ireland cannot belong to this name. But while it is quite possible that he is correct, it is by no means certain whether we are speaking of the same gathering, since I had three distinct sets, two of which must be put under *Robertianum* (see p. 41) and another (Ref. No. 4581) from the rocks west of Ballyvaghan, which is apparently a local form, since plants from the vicinity sent me this year by Mr. P. O'Kelly are not identical. Mine were small prostrate plants agreeing very closely in facies with Jordan's type *Villarsianum*, had

yellow anthers (therefore not *Robertianum*) and almost odourless foliage. The specimen I examined has glabrous carpels, but I find in some others from Ballyvaghan a very few hairs are present. Jordan in contrasting *Villarsianum* with *Robertianum* does not mention the hairiness of the carpels, but he includes in his diagnosis "glabris," and his type specimen, which is young, at Kew, Mr. W. B. Turrill tells me has glabrous smooth carpels. But a point of interest arises. Is the hairy or glabrous character of the carpels adequate to separate the two groups? I have plants indistinguishable from *Robertianum* by other characters, and from inland situations, with glabrous carpels, whereas many plants passed as *purpureum* by British authors have more or less hairy carpels. It may be borne in mind that Syme (Eng. Bot. ii., 204) says the hairs are deciduous, and the hairiness varies greatly in quantity. However the monographer of the genus in the *Pflanzenreich* has quoted Rouy and Foucaud's (Fl. Fr. iv. 95, 1897) arrangement, than which apparently he had nothing better to suggest. But it is quite evident that the last word has not been said upon the subject. Dr. Ostenfeld's suggestion that at any rate his Clare specimens may represent a special variety is extremely probable, and closer attention being given to the group may show that *Robertianum* has a parallel series of variations to *purpureum*, and that in Britain we may possess several endemic forms.

902. *Potentilla procumbens* Sibth. var. **subsericea** (Wolf in Mon. Potentil. 653, 1908, as forma), near Truro, I.P.E., 1911. I have also seen it near Penzance and from Dolgelly, Merioneth.

927. *Rosa sarmentacea* Woods var. *stenoarpa* (Déség.), Westwood, York. I.P.E.

942. *Rosa omissa* Déségl. var. *submollis* (Ley), Silverdale, Lancashire, I.P.E., 1911, teste Wolley Dod.

1000b. *Parnassia palustris* L. (see p. 28). The dwarf plants with large flowers and fruits which we collected in the damp "slacks" of the Southport dunes, and which Dr. Graebner and myself thought formed a good variety, proved constant in the Berlin garden. Meanwhile it has been described and named var. *condensata* by Travis and Wheldon (Journ. Bot. (1912), 254) who have had the plant under observation for some years. This year I have also seen it on low cliffs at White Park Bay, Antrim, and in Forfarshire on the Sands of Barry.

1015. The new species of *Sedum* which Prof. Graebner proposes to name after the writer has been already alluded to; it appears to replace *S. acre* in Britain so far as the native habitats are concerned.

1077. *Mesembryanthemum acinaciforme* L. Under this name Prof. Graebner (p. 73) alludes to the Cornish plant. I am hoping to get Dr. Schönland's opinion on it, as the plant was named *aequilaterale* by English botanists (see *Flora of Cornwall*), while I rather leant to its being *M. edule*.

1260. *Erigeron borealis* (Vierh.)—*E. alpinus* auct. Brit. To this name Ostenfeld (p. 59) refers the British *E. alpinus*, differing as it does from the true plant by the obtuse basal leaves, the rather sparingly hairy base of the stem, and the strongly hairy, often purple phyllaries, characters which would have led me rather to call it var. *borealis*, than a distinct species.

1401. *Senecio vulgaris* L. forma *crepiformis*. The Blakeney plant with conical receptacles, which I thought might be due to a fall, I find are really owing to the attack of a small larva.

1420. *Arctium nemorosum* Lej. This name as Dalla Torre and Sarntheim (*Fl. Tirol*, 595, 1912) show, must be replaced by that of *A. macrosperrnum* (Wallr.) Dalla Torre and Sarntheim.

1657. *Sonchus oleraceus* L. var. **albescens** Neum. Galway, Ostenfeld, see p. 59, a first British reference.

1695. *Erica Tetralix* L. A plant which was not uncommon at the Lizard plant with small corollas may be distinguished as *f. parviflora*.

1696. *E. Mackayi* × *Tetralix* = × *E. Praegeri* Ostenf. in *New Phyt.*, 120, 1912. This has been in cultivation in the Edinburgh Bot. Gardens for some time (although not I believe distinguished from *E. Mackayi*), the roots coming from Craigga More. There seem to be good reasons for accepting Dr. Ostenfeld's suggested name and origin of this plant.

1931. *Euphrasia stricta* Host. Dog's Bay, Galway.

1933. *E. brevipila* Burn. and Grem. Silverdale, Lancash.; Westmoreland; Dunkeld, E. Perth; Lawers, Mid-Perth; Trosachs, W. Perth; Ballyvaghan, Co. Clare; Killarney, Kerry; New Forest, S. Hants.

E. fennica Kihlm. This plant I collected some years ago on Exmoor, Somerset, but saw it again last year at Clifden, Co. Galway. Professor R. von Wettstein agrees to the determination, which was suggested by Professor Lindman. New to Britain.

1948. *Bartsia Odontites* Huds., var. *verna* (Reichb.) Dog's Bay, Co. Galway, I.P.E.

1960. *Melampyrum pratense* L. var. *hians* Druce in *Naturalist*, X, (1884-5), 35.

Dr. Ostenfeld (l.c. 62) suggests that this plant is a form of *M. vulgatum* Pers., but apart from the question of splitting *M. pratense* into two species, I strongly demur to this well-marked plant being made a *forma*. If the differences justify two species being made out of *Erigeron alpinus*, surely the differences, not only floristic but of habitat, which exist between *hians* and the type, establish its claims at least to varietal distinction; indeed both Professors Schröter and Graebner thought it was a good sub-species. Through the kindness of the former botanist, who sent specimens to the well-known specialist on this group, Dr. Ronniger, the fact has been ascertained that he considers it to be identical with the sub-species *M. paradoxum* which he has described in Schinz and Keller *Fl. der Schweiz*, 489, 1909.

With regard to *M. vulgatum* Persoon, this was published in the *Synopsis*, ii, 151, 1807, as "5. *vulgatum* (*pratense* L) flor secundis lateralibus, cor. clausis, cal. subcolorati laciniis adscendentibus, caul. ramosissimo. Engl. Bot. t. 113. *M. sylvaticum* Huds, Ray. Hab. in sylvaticis frequens. Cor. tubus albicans. Anth. subcoalitæ." Now it appears evident to me that this is a still-born name, being simply synonymous with *M. pratense*, which the author quotes. The next species is "6. *alpestre* (*sylvaticum* L.)" where a similar unnecessary and invalid change has been made by Persoon, who adds "Obs. Ob nomina trivialia incongrua, hac duæ species ut plurimum com-

mutantur." From which it is evident that he changed the names not because they represented different species, but because they were not descriptive of their place of growth.

It may well be urged that there are two distinct races or species, one northern, the true *M. pratense*, and a second which has been called *M. vulgatum*; but to connect the species with Persoon's name, appears to be, if not invalid, at least undesirable. . . . *Hians* is a very unvarying plant so far as the deep golden colour of the corolla goes, but it has a small range of leaf-variation, and, therefore, if Persoon's name is admissible, it should be put as *M. vulgatum* var. (not forma) *hians*.

1899. *Mentha rubra* Sm. One of the mints collected in Cornwall in 1911 has been named by M. Briquet as var. *rariplata* Briq. in Bull. Herb. Boiss. iv, (1896), 782. The *M. rubra* from the side of the Tay, Perth, p. 34, Mr. C. E. Salmon (*Report Bot. Exchange Club* (1911, 113) would rather refer to *M. gentilis*, a not improbable suggestion; but until fresh material is obtained, I propose to leave it as it stands.

2075 *Lamium Galeobdolon* Crantz var. *montanum* (Pers.)= *Galeobdolon luteum* Huds. Ostenfeld (p. 62) remarks on this as the form found in Britain. I recognized this in the *Flora of Berks.*, 410, 1897; the var. *vulgare* (Pers.), with quite another area of distribution, i.e., Sweden, Denmark, Germany, Austria, etc., has long leaf-like bracts, and has not yet been recorded as British.

2159. *Salicornia*.—The North Bull plant, found by Ostenfeld, Lindman and myself in 1911, is still under Dr. Moss' observation; he will probably name it as a distinct species.

2200. *Rumex obtusifolius* × *nemorosus*=*R. Dufftii* Hausskn. Cressbrook Dale, Derby; Tay side, Perth, Ostenfeld, l.c.

2210. *Rumex Acetosella* L. var. *acetoselloides* (Bal.), Foulshaw Moss, N. Lancashire, Ostenfeld, l.c.

Var. *angiocarpus* (Murb.) Potter Heigham, Norfolk, and a form verging towards *acetoselloides*, Ostenfeld, l.c., Clifden, Galway.

2276. *Salix aurita* × *cinerea*=*S. lutescens* A. Kern. Some of the members of the Excursion thought one of the forms found near Clifden, Galway, was *S. livida*; but the Rev. E. F. Linton passes all my plants as the above, and Dr. B. Floderus has rejected the suggestion of *S. livida*, and believes these gatherings to be an *aurita* form, but is unable to see the presence of *cinerea*.

2315. *Helleborine palustris* (Schrank) (vel. *longifolia* R. and B.) var. *ericetorum* (A. and G.) Druce, Southport Dunes. Dr. Graebner assents to the correctness of my identification. It also occurs near Raven Point, Wexford.

2442 (2) *Juncus ranarius* Songen and Perrier (see page 37): Southport, determined by Dr. Graebner. The claim to specific grade for this plant is challenged by Dr. Ostenfeld (p. 63) and he quotes Buchenau (*Mon. Junc.* in Engler's *Pflanzenreich* (1906) where he says "we do not find *J. ranarius* given as a species, not even as a variety. . . . We can no more give specific rank to the saline form of *J. bufonius* than we can make a separate species of a glabrate form of an ordinarily hairy species (e.g., *Melandrium album*).") I am by no means anxious to get into the line of fire between two conflicting

authorities; but I think Dr. Ostenfeld is unaware of Buchenau's change of mind. When he wrote his monograph, it is true he did not think *ranarius* worthy of notice, but subsequently (as Dr. Graebner informs me), having seen its constancy in culture, he became convinced it was a good species. I may add that Dr. Ostenfeld's example does not appear to be well chosen, since we have a halophytic form of *Juncus compressus* raised to specific rank as *Juncus gerardi*, and this in less saline situations shows the passage to the type. Again in *Melandryum Preslii*, we have a purely glabrous form of *M. dioicum* (associated it is true with other characters), raised to specific rank. Moreover, *J. ranarius* does not appear to be strictly halophilous, since Dr. Graebner has named some plants, which I collected on sandy ground, in inland situations, at Pyrford, Surrey and Woolmer Forest, Hants., as *J. ranarius*; to which the suggested name var. *halophilus*, therefore seems quite inappropriate. Dr. Graebner tells me that when *J. bufonius* and *ranarius* grow together they can be readily distinguished.

2538. *Scirpus cespitosus* L. var. **austriacus**. (Palla). We are greatly indebted to Dr. Ostenfeld for his discrimination of two forms, and for his kindness in showing us how they can be identified. I gathered *germanicus* in Co. Tyrone this year, and *austriacus* in Argyll and Inverness.

2684. *Agrostis alba* L. A common form with dark purplish-black florets was found at about 3,000 feet on Ben Lawers, but Professor Hackel does not separate it from the type.

2687. *A. canina* L. var. *mutica* Gaud. Killarney.

2733. *Phragmites vulgaris* (Lam.) Druce (vel. *P. communis* Trin.=*Arundo Phragmites* L.) forma **latifolia**. This large form with leaves, 4 cm. in breadth—much greater than those of the common reed—which occurred in the Broads, cannot, I think, belong to the South European *Arundo isiaca*, since ours has deep-purplish panicles. I overlooked mentioning it in my notes and am indebted to Dr. Ostenfeld for drawing attention to it: forma **cæspitosa** also occurs.

2745. *Molinia caerulea* Moench. Professor Hackel referred the plant from Crowden Clough (p. 38) with interrupted panicles to the type.

2761. *Poa trivialis* L. The form of this from Ben Lawers and from Crossfell, Cumberland, which Dr. Ostenfeld suggested might be var. **subalpina** Beck (Fl. Nied. Oster, 86, 1890), Professor Hackel does not separate from the type.

2827. *Agropyron pungens* (vel. *litorale*) \times *repens*= \times *A. Oliveri* mihi (p. 323, 1912). I am pleased Dr. Ostenfeld (p. 126) has independently come to the same conclusion respecting the Blakeney plants. He suggests that *litorale* rather than *pungens* should be the name used. Hackel, the well-known authority on the Gramineæ, still uses the name *A. pungens*, and to it refers the Burlesden Bridge plant, which I thought was nearer *repens*.

2880. *Asplenium*. The remarkable form which appeared so intermediate between *marinum* and *Adiantum-nigrum* with which it grew, I submitted to our well-known fern specialist, Dr. Stansfield, who reported it to be only a form of the latter species. Dr. Ostenfeld tells us that Christensen also refers it to the same plant. This affords another instance of the fact that because a

plant has intermediate characters between two species, it need not necessarily be a hybrid.

2893. *Polystichum aculeatum* Roth. var. *lomchitoides* Deakin. Christensen puts this as *P. lobatum* var. *Plukenetii* (Lois) I.c. 127, but I am not certain which name has priority: they are, I take it, synonymous.

2923 (2). *Azolla filiculoides* Lam. We are indebted to Dr. Ostenfeld for determining the *Azolla* from Norfolk as this species, as I collected no specimens. This year, however, through the kindness of Mr. J. Cator, M.P., I have had specimens from Woodbastwick, which prove the accuracy of Dr. Ostenfeld's determination. Our generous host, Mr. Beamish, also sent me specimens from the brackish waters near Queenstown Junction, which prove to be the same species (teste N. E. Brown) and additional to the Irish list. *A. caroliniana* Willd., however, occurs in the Cherwell, near Oxford and in the Thames near Sonning and Henley, as well as in the Pang, near Suleham, Berks.

As one practical outcome of the Excursion may be mentioned the acquisition of Blakeney Point with its interesting accumulation of shingle, which Professor Oliver has made the scene of his own patient and minute investigations, and which proved to our visitors an extremely fascinating area both for its ecological and floristic value. It therefore appeared to be most desirable that it should be preserved for all time as a nature-reserve, since besides the points of interests alluded to it, has a rich bird fauna and many interests for the entomologist, as well as much scenic charm. Fortunately, through the generosity of the Fishmongers' Company and some others interested in the matter, a sufficient sum of money was placed in my hands, and through the kind help of Professor Oliver and other persons the troublesome and lengthy negotiations for purchase were eventually successful. To the shingle bank has been added an additional area of "salttings." This makes the reserve more homogeneous, and brings the total area acquired to more than 1,000 acres. Under certain conditions, and with the appointment of special trustees, the property has now been handed over to the National Trust; an object lesson, which it is hoped will have its effect in securing many other spots of interest to the naturalist and preserving them, as far as possible, in their pristine condition for all time.

XII.—REMARKS ON THE CHARACTERS AND NOMENCLATURE OF
SOME CRITICAL PLANTS NOTICED ON THE EXCURSION.

By C. E. Moss.

NYMPHÆA *alba* var. *occidentalis* Ostenfeld in *New Phyt.* xi, 116 (1912). Mr. Druce still prefers the generic name *Castalia* which involves the use of *Nymphaea* for *Nuphar*; but I do not doubt that most botanists will be pleased to find that it is in strict accordance with the international rules of nomenclature to retain *Nymphaea* and *Nuphar* in their more familiar meanings (cf. Briquet, *Prodr. Fl. Cors.*, 577 (1911), and Rendle in *Journ. Bot.*, 277 (1911)).

It is interesting to note the two views which the members of the excursion show a tendency to adopt with regard to this and other new forms encountered on the excursion. On the one hand, some members are inclined to regard them as characteristic of, and related to, the insular climate of western Europe in general; and this view is crystallised in the name which Dr. Ostenfeld has bestowed upon the new water-lily. On the other hand, some other members suggest more or less definitely that they are instances of endemism in a continental island. It is too early to pronounce any verdict on the merits of the two hypotheses; and indeed it may well be that each will prove to be deserving of a measure of support. I hope, however, that the theory of endemism will not be hastily adopted, even as a working hypothesis. Before the new forms receive new names, it is essential that they should be compared with similar and closely allied plants known from the mainland of Europe. This, of course, Dr. Ostenfeld has done; but it seems to me there is a real danger in the theory of endemism as now being put forward—a danger of new, or presumably new, British forms receiving new names which will be found later to be mere synonyms of older and well-known names in some European countries. Even if forms have arisen independently in the British Isles since the

Glacial Period, there are botanists who see no reason to forbid the belief that some such forms have since spread to the mainland.

Helianthemum chamaecistus Miller *Gard. Dict.*, ed. 8, no. 1 (1768). The tomentose form (*H. vulgare* var. *tomentosum* Irvine *Ill. Handb. Brit. Plants*, 690 (1858)) mentioned by Dr. Ostenfeld (p. 117 (1912)) is by far the commonest British form. The hairy form (*H. vulgare* var. *virescens* Irvine *loc. cit.*), however, does occur in England, as on a Greensand heath, in western Cambridgeshire. I have grown the two forms in my garden for three years; and the single separating character remains constant. I think that *Cistus surrejanus* L. *Sp. Pl.* 527 (1753), as figured in *Eng. Bot.* ed. 1, t. 2207, is the second of the above forms with an imperfectly developed corolla. *C. surrejanus* was discovered by Edward Du Bois in the neighbourhood of Croydon, Surrey; and Borrer used to find it occasionally in the same county.

Smith's *Cistus helianthemum* and *C. tomentosus* (= *Helianthemum tomentosum* Gray *Nat. Arr.* ii, 663 (1821)) refer to two forms of Irvine's var. *tomentosum*; but whether or not they are good varieties is doubtful. In any case, *H. tomentosum* Gray (*l. c.*) is simply *Cistus tomentosus*, Smith, *Eng. Bot.* t. 2208, which is founded on *C. tomentosus* Scopoli *Fl. Carn.* ed. 2, i, 376, t. 24 (1772). Both Smith's *C. helianthemum* and his *C. tomentosus* had leaves "densely downy, white, and hairy beneath." Hooker (*Brit. Fl.* 258 (1830)) thought *C. tomentosus* was not even a well-marked variety of *H. vulgare*, and reduced it to a synonym; and in this he has been followed by all British botanists. I should add that Smith's figure of his *C. tomentosus* has very differently shaped petals and leaves from that of Scopoli.

In the *Cambridge British Flora*, I propose to restrict the term sub-variety to forms like the above which are distinguished by a single but constant character, *i.e.*, a character which is, so far as one can judge, not directly caused by habitat-conditions, as seems to be the case with regard to the two forms of this species. To forms whose characters appear to be directly due to habitat-conditions (cf. *Polygonum amphibium* forma *terrestre*), I propose to restrict the term *forma*. Varieties will be those forms which are separated by more than one constant character, but which are not sufficiently far removed from their allies to be treated as species.

Stellaria dilleniana Moench *Enum. Pl. Hass.* 214, t. 6 (1777); *S. graminea* var. β L. *Sp. Pl.* 422 (1753); *S. palustris* Retzius *Fl. Scand.* ed. 2, 106 (1795); *S. glauca* Withering *Arr. Brit. Pl.* ed. 3,

420 (1796). There are several forms in England of this highly variable species in addition to the one noticed (p. 309 (1911)) by the party in Norfolk. Last year, in a fen in Huntingdonshire, I noticed that the following characters occurred in all their theoretical combinations:—(1) glaucousness (G); (2) non-glaucousness (g) or greenness; (3) large petals (P), about once-and-a-half to twice as long as the sepals; (4) small petals (p), about as long as the sepals; (5) many-flowered cymes (C); and (6) few-flowered cymes (c). All the forms grew in watery places in the fen; but, as regards their morphological characters, the “g p” forms were with difficulty distinguishable from the allied, and also variable *S. graminea*. In fact, by botanists of Bentham's school, such forms might be held to justify a return to the Linnæan view that *S. graminea* and *S. dilleniana* ($=S. palustris=S. glauca$) are simply forms of a single polymorphic species.

Now, many of the combinations of the above six characters have received names from systematists. Adopting, for the time being, the names in Rouy's *Fl. de France*, iii, 233 (1896), the following plants occurred in the fen in question:—G P=*S. palustris* var. *communis*; g P=*S. palustris* var. *communis* subvar. *viridis*; G p=*S. palustris* var. *parviflora*; g p=*S. palustris* var. *parviflora* subvar. *viridis*. Thus, if only the four characters, G, g, P, p, are considered, all the possible combinations are named. If, however, other combinations of two characters are considered, there are the following combinations unnamed:—G C, G c, g C, g c; and P C, p C, P c, p c.

There are also the following eight theoretical combinations to consider:—G P C, G p c. With regard to these, three of them have been named by Magnier in *Bull. Bot. Soc. France*, xxviii, 82 (1881); and G p C=*S. litigiosa* Magnier; g P C is *S. mænchii* Magnier; and G P c is *S. heterophylla* Magnier. It will be seen that Magnier uses three characters, and names three combinations; but the following combinations he leaves without names:—G P C, G p c, g p C, g P c, and g p c.

The first form of the species to receive a binomial was g p c which was named *S. dilleniana* by Moench; and, as this name is valid, it must, by the rules of nomenclature, be used to designate the whole species. The later but more familiar names must unfortunately be discarded. Of these, *S. palustris*, like *S. dilleniana*, referred to a “g” form as neither Linnæus nor Retzius mentions the glaucous character; and Withering's name *S. glauca* refers to

a "G P" form. The form figured in *Eng. Bot.* t. 825 is the "G P c" type. Mr. Druce recently (in *Brit. Bot. Rep.* for 1910, 546-7 (1911)) pointed out that the name *S. dilleniana* must replace the others.

It is obvious, I think, that the forms which have been named according to the methods of systematists have no stronger theoretical claim to be thus brought into prominence than those which have not been named. Ought we therefore to name the latter combinations, or reject the names of the former? To be logical, we should do either the one or the other.

I wish to ask, however, if it is not the case that the kind of variation which occurs in *S. dilleniana* is not amenable to the particular form of naming which systematists in all countries adopt? Is it not more desirable, in cases like this, where (so far as can be judged without experiments) characters hybridise and rehybridise and continue to be transmitted whole, to name the resulting forms by some symbolic method, such as is adopted by Mendelian workers? If this were done in systematic works, the combining characters would be indicated in the specific description, and the segregating forms would not be there named at all, except perhaps symbolically and systematists need no longer, in these cases, encumber their works with an almost interminable number of sub-specific divisions and names.

To show how systematic works may be, and indeed often are, encumbered by names and synonyms of the forms here being discussed, let us consider the case of the characters G, g, P, p. Rouy (*loc. cit.*) divides these primarily by the characters of large petals (P) and small petals (p), thus having two varieties, P and p; then each variety is sub-divided by the character of glaucousness (G) and non-glaucousness (g), giving the sub-varieties G p and g p. But other botanists might first divide the species by some other corresponding pair of characters, e.g., G and g, and sub-divide these by the remaining pairs; and this plan would result in sets of different names.

Again, who would say there are no additional characters to G, g, P, p, C, and c, say, for example, with regard to the width of the leaves, the width of the petals, the degree of splitting of the petals, and so on? Is each additional combination, as it is discovered, to receive a name?

If, in these and similar cases, the symbolical method of naming were adhered to, systematists would have fewer opportunities of becoming controversial in a vain attempt to settle which particular

one, of a number of equivalent biological forms, ought to be regarded as the "type" of the species.

The combination g P C named *S. mænchii* by Magnier is not, as Magnier implies, the combination originally named *S. dilleniana* by Moench: this, as shown by Moench's description and figure, is g p c.

Sagina scotica Druce in *Rep. Bot. Exch. Club for 1911*, 14 (1912); in *New Phyt.* xi, 358 (1912); *S. procumbens* \times *saginoides* Ostenfeld in *New Phyt.* xi, 117 (1912). Roots of this critical plant, transplanted from Ben Lawers, have been grown in my garden. The plant spreads in the vegetative manner described by Dr. Ostenfeld, I do not, however, agree with Mr. Druce that its petals are "much longer" than the sepals: the petals and sepals are about of the same length; and the description of the rhizome as "subligneous" is not very happy. The plant has produced seeds freely; and these I have sown. It will be interesting to observe whether or not any of the characters show signs of segregation, as one would expect if, on Dr. Ostenfeld's supposition, the plant is a hybrid.

In connection with the suggestion of hybridity, I think that too much importance has been attached to the matter of seed-fertility. There are so many hybrids, even of species not very closely related (e.g., *Geum rivale* \times *urbanum*) which are fertile, and not a few good species (e.g., *Ranunculus ficaria*) which are at least partially sterile in certain districts, that the matter of seed-fertility has really very little bearing on the question of hybridity.

Altogether there have been three suggestions as to the nature of the plant. I suggest that a fourth needs consideration. Is the plant a variety of *S. procumbens*? If so, it is indeed a striking one; and, in any case, it is most curious that Scottish botanists have never named the plant before, though some of them allege that they have always been perfectly familiar with it. The view that the plant may be a variety of *S. procumbens* is suggested by the fact that it has a pronounced central rosette of leaves, as in this species.

Geranium robertianum L. Some discussion (pp. 41-42, 57-58, 114-115) has already taken place regarding certain small-flowered plants allied to this species. I suggest that some (though probably not all) of these forms are hybrids of *G. robertianum* and *G. lucidum*. Last May, the British Vegetation Committee made an excursion in Leigh Woods, near Bristol. Here, growing between *G. robertianum* and *G. lucidum* was a small-flowered plant which is doubtless one of the varieties of *G. robertianum* "forma" [= "race"] *purpureum*

Rouy *Fl. France*, iv, 96 (1897); but the position and the characters of the plant suggested that it might have had a hybrid origin. However, other of the forms in question may be good species or varieties, for it seems certain that forms may arise either as true varieties or by hybridisation, and yet closely resemble each other. As Professor Drude has truly stated (p. 78), "the complexity of the subject has naturally been increased by new phylogenetic and ecological studies"; and this complexity seems more likely to be increased than diminished as time goes on. There is certainly need here, as in many similar cases, for experimental work.

Ulex Gallii Planchon *Ann. Sci. Nat. ser. 3*, xi, 207, t. 9 (1849). It will come as a shock to British botanists to know that this plant is, in Ascherson and Graebner's *Syn.* vi, pt. ii, 288 (1907), reduced to a hybrid of *U. europaeus* and *U. nanus* (or *U. minor*). Of course, the distribution in this country of our three species of *Ulex* is wholly against such a view; and I am sure that no British botanist will agree with or sympathise with the hypothesis of the hybrid-nature of *U. gallii*. Rouy et Foucaud (*Fl. France*, iv, 243 (1897) also definitely reject the theory that *U. gallii* is a hybrid. As the plant is confined to France and the British Isles, the deliberate and unanimous verdict of French and British botanists should surely be accepted. However the plant was seen in many places on the excursion, so that the members had an opportunity of arriving at an independent conclusion.

I may add that *U. europaeus* occurs throughout Great Britain, usually at altitudes below about 250 metres; that *U. gallii* gets no further north than southern Scotland, and usually ascends 100-200 metres higher than *U. europaeus*; and that *U. nanus* is decidedly rare and local north of the Thames valley, has its northern limit in central England, and is a more pronounced lowland species than even *U. europaeus*. In Ireland, both *U. europaeus* and *U. gallii* are widespread and locally abundant; and *U. gallii* usually occupies a higher zone than *U. europaeus*. *U. nanus* is unknown in Ireland. It will be seen that the distribution of the three species gives no support whatever to the view that *U. gallii* is a hybrid.

Pyrus aucuparia L. [*Pyrus aucuparia* "var. (or forma)" *flava* Druce in *New Phyt.* x, 312 (1911) nomen; *Sorbus aucuparia* var. *flava* Ostenfeld *op. cit.* xi, 120 (1912) nomen.] Pale-fruited forms are very interesting from the standpoint of the study of evolutionary variation; but it is a question whether they, and also the colour-variations in petals, should receive formal systematic names.

Parnassia palustris var. *condensata* Travis and Wheldon in *Journ. Bot.*, 254 (1912). This is the form seen in the damp dune-hollows near Southport. I do not think this is an endemic variety. I have seen what I believe to be the same form in similar situations in Brittany; and I understand from Dr. Ostenfeld that it occurs in Denmark. Mr. J. Cosmo Melvill (*Journ. Bot.* 1, 376 (1912)) contends that its characters are unstable, and that it should be reduced to a *forma*. Obviously, cultural experiments are indicated.

Sedum anglicum Hudson *Fl. Angl.* ed. 2, 196 (1778). Dr. Rübel informs me (*in litt.*) that the name *Sedum album* which appears in his charming account of the vegetation of Killarney (pp. 54-55 (1912) should be *S. anglicum*. Whether or not *S. album* is indigenous in the British Isles is doubtful.

Sedum acre L. (See pp. 111-112, 115). It may well be that the common form in this country differs from that in central Europe; but it is, in my opinion, much too early even to hint at its being one of "quite a large number of forms endemic in Britain." Do Professor Graebner and Mr. Druce seriously maintain, at this early stage, that the new form does not occur, for example, in northern France? However, until the plant has been described, one cannot state that one has seen it elsewhere, or that the common European form of the species is unknown in Great Britain and Ireland.

Enanthe fluviatilis Coleman in *Ann. and Mag. Nat. Hist.* ser. 1, xiii, t. 3, 188 (1844); in *Eng. Bot. Suppl.* t. 2944 (1848); in Webb and Coleman *Fl. Hertford*, 369 (1849); Babington *Manual*, ed. 2, 141 (1847); Glück *Biol. und Morph.* iii, *Die Uferflora*, 429 (1911); *Œ. phellandrium* var. *fluviatilis* Babington *Manual*, ed. 1, 131 (1843); [*Millefolium aquaticum* Dillen in Ray *Syn.* ed. 3, 216 (1728)]. Professor Drude (p. 79) appears to regard this plant as of the same rank as the small varieties of *Helianthemum*, etc., which have been discussed in connection with this excursion; but that is not the view of those botanists who have carefully studied Coleman's plant. It may perhaps be arguable whether the plant is a species or a variety; but if it be reduced to a variety, it would be an uncommonly good variety, and consistency would demand the reduction of another hundred or more British species (exclusive of "species" of *Rubus*, *Hieracium*, *Euphrasia*, and the like) to varietal rank. In my opinion, the plant should remain as a species. Coleman studied it very carefully before naming it, and tested its constancy; his description is full and clear, and his figure accurate.

The species illustrates very well the danger involved in pushing to extremes the theory of endemism in British plants. The plant was ignored by continental botanists until quite recently, and was regarded as endemic by some British botanists.

Coleman when describing the plant gave his reasons for believing that the *Œ. phellandrium* of Koch was in part the new species; and Coleman's statement has received justification in Glück's discovery of *Œ. fluviatilis* in Germany and in Luxembourg. Further, Dr. Ostenfeld has this year found the plant in Denmark. The indications, therefore, are that, instead of being an endemic species, it will prove to be a member of the flora of other European countries. I have no doubt that it will be found to occur in other parts of Germany—western Germany at least, in Holland, in Belgium, and in France; and I should not be surprised to find that it occurs in Switzerland and Austria. The determination of its northern, southern, and eastern limits will be an interesting question. Will it occur in northern Africa, like *Salicornia lignosa*, which was thought to be endemic in England up to two years ago? Dillen (*loc. cit.*), in the first British reference to the plant, cites "*M. aquaticum* Matth. *Ed. Valgr. in fol. P. ii*, p. 484; *aquaticum umbellatum coriandri folio* C. B. Pin, 141; *aquaticum foliis coriandii* Matthioli, J. B., *iii, 2, 9.*" If these citations are correct, and they seem never to have been enquired into, there was no reason at any time for regarding *Œ. fluviatilis* as endemic in the British Isles.

The plant (*Œ. fluviatilis*) prefers running water: its ally (*Œ. aquatica*=*Œ. phellandrium*) prefers stagnant water. Its stem is fusiform and creeping at the base: that of *Œ. aquatica* remains cylindrical to the base. Its aerial leaves have broad, often almost overlapping, segments: the corresponding segments of *Œ. aquatica* are smaller, narrower, more acute, more deeply cut, and either not or scarcely overlapping. Its partial umbels have longer peduncles (*c. 3 cm.*) than *Œ. aquatica* (*c. 1 cm.*). Its fruits are longer (*c. 5 mm.*) than those of *Œ. aquatica* (*c. 3 mm.*), and are more compressed (*c. 1 : 2*) than in *Œ. aquatica* (*c. 2 : 3*). It is frequently a social plant, its stems and leaves often floating in an impenetrable tangled mass on the surface of small rivers and large drains, whilst *Œ. aquatica* in this country usually occurs here and there, in small ditches and in other stagnant waters. Both species vary considerably both as regards their respective land-forms and water-forms; and some of these have been named by Professor Glück. Each species may perhaps include a number of small locally endemic forms; but

Œ. fluvialis is too distinct from its closest ally *Œ. aquatica* to be regarded as the kind of plant which would be endemic to the British Islands.

Arctium nemorosum Lejeune." The plant so named by many botanists was seen in many places on the excursion, as in Derbyshire, Lancashire, and Perthshire; but the name, as given above, has no claims to acceptance. It is merely a name—" *Arctium nemorosum* Lej. in litt."—which appears in synonymy under *Lappa intermedia* Reichenbach *Icon.* xv, 54 (1853). Lange in *Dansk. Fl.* 357 (1886 88) cites "*A. nemorosum* Lej. *Fl. Spa* (1813)." However, I could find no such name in the copy of *Fl. Spa*, which I consulted; and Lange's omission of the page is suggestive.

Torre and Sarntheim (*Fl. Tirol* 595 (1912)) refer the plant to *Lappa macrosperma* Wallroth in *Linnæa* xiv, 639 (1840); but is this not *A. majus* Schkuhr *Handb.* iii, 49 (1808)? If this is so, the plant would appear to be better named *Arctium intermedium* Babington *loc. cit.* The Raian synonym, doubtfully cited by Wallroth, is referred to *A. majus* by Babington in *Ann. and Mag. Nat. Hist.* ser. 2, 372 (1856).

The plant is intermediate between *A. majus* and *A. minus*; but it is not a hybrid, as its distribution in Great Britain (recently worked out by Mr. A. H. Evans, who will shortly publish his views on the British forms of *Arctium*) clearly shows.

Vaccinium oxycoccus var. **microcarpum**; *Oxycoccus microcarpus* [Turczaminow in *Sched.* 1833, ex] Ruprecht *Hist. Stirp. Fl. Petrop.* 56 (1845).

As surmised by Professor Lindman, there are two forms of the cranberry in England, a small-fruited form and a larger-fruited one. I find that the former occurs on the peat-moors of the hills of the west and north of Great Britain, and I have recently collected it in Cheshire and Sutherlandshire. In addition to the size of the fruits, the large-fruited form is rarer and more local in the north; and it may be a lowland and southern form: I have gathered it in lowland moors in Somerset and Cheshire. The small-fruited form has glabrous pedicels, those of the large-fruited form being slightly hairy. In the small-fruited form, the flowers are 4-partite or commonly so, those of the large-fruited form being not infrequently 5-partite. The small-fruited form has rather smaller and more triangular leaves, and rather shorter petals. These are all minor differences, but the *ensemble* of characters is sufficient to constitute a variety.

As pointed out by Mr. J. Britten (*Journ. Bot.* viii, 291 (1870)) there are two fruit-forms of *V. oxyccous*, one with spherical the other with pyriform fruits. I have seen pyriform fruits on the large-fruited form only, and near the Cheshire locality mentioned by Mr. Britten.

Gentiana nivalis L.—It is well known that the British form of this, gathered on Ben Lawers, is smaller than the alpine form. In addition to this, the Ben Lawers plant has rather broader leaves, and shorter and broader petals. In Swiss specimens, the petals are often less than half as broad as long; whereas in the Ben Lawers plant, they are about two thirds as broad as long. The Ben Lawers form here described is well depicted in *Eng. Bot.* ed. 1, t. 896.

It may be that the Scottish form is an instance of the local endemism of a small variety; but before it is named, I hope it will be ascertained whether or not it occurs abroad, and whether or not the Swiss form occurs in Scotland.

Lamium galeobdolon Crantz *Stirp. Austr.* ed. 2, 262 (1769); *Galeopsis galeobdolon* L. *Sp. Pl.* 580 (1753); Hudson *Fl. Engl.* 226 (1762); Miller *Gard. Dict.* ed. 8, no. 4 (1768); *Galeobdolon luteum* Hudson *Fl. Engl.* ed. 2, 258 (1778). Persoon (*Syn. Plant.* ii, 122 (1807)) briefly characterized two forms of this; and earlier names above cited would appear to be simple synonyms of *Galeopsis galeobdolon* L. Hudson's name, *Galeobdolon luteum*, is valid if the plant is removed from the genus *Lamium* into *Galeobdolon*; but I do not think it ought to be cited as referring to any particular segregate of the species. Persoon's first plant, his *Galeobdolon vulgare*, is briefly diagnosed by the words "fol. omnibus ovatis, involucro 4-phyllo," and Smith and Curtis are cited. The second plant, *G. vulgare* var. *montanum*, is summarised by the words "fol. summis lanceolatis, involuer. 6-8 phyllo." It is usually assumed that the British plants are the var. *montanum*, in spite of Persoon's allocation of synonyms; but British botanists (see Syme *Eng. Bot.* vii, 77 (1867) and Williams *Prodr. Fl. Brit.* i, 393 (1910)) have always assumed that the two plants were unworthy of recognition. This may have been because there is only one form in this country, as Dr. Ostenfeld suggests; but if so, the form is rather variable. It may be that further observation will reveal the existence of the second form also as a British plant. Syme (*loc. cit.*) adds that the English plant occasionally has "the bracts all broad and similar to the leaves (*G. luteum* Reichb.)." This remark applies to a plant drawn for the *Cambridge British Flora* by Mr. E. W. Hunnybun,

from the Isle of Wight; and this plant also has its leaves doubly serrate, the leaves of the barren stem strongly cordate, and the flowers more numerous in each verticillaster.

"Polygonum aviculare L." (agg.).—The forms of this excessively variable "species" were frequently discussed on the excursion. It was a great advantage to have Professor Lindman at hand, for he probably knows more about the forms in question than any other botanist. Quite recently, Professor Lindman (in *Svensk. Bot. Tidskrift*, vi, iii (1912)) has published his mature views with regard to them. He divides the aggregate "*P. aviculare L.*" into two species, *P. heterophyllum* and *P. æquale*; and a third allied plant he had previously described as *P. calcatum*.

P. heterophyllum Lindman *op. cit.*, p. 690.—Common, chiefly in arable land, as far north as Forfarshire (!) at least.

P. heterophyllum var. **angustissimum** Lindman *op. cit.*, p. 691; *P. aviculare* var. *angustissimum* Meisner in DC. *Prodr.* xiv, 98 (1856).—This has been drawn for the *Cambridge British Flora* by Mr. Hunnybun, from Huntingdonshire specimens. Probably it is not uncommon.

P. heterophyllum subsp. **rurivagum** Lindman *loc. cit.*; *P. rurivagum* [Jordan ex] Boreau *Fl. Centr. France* ii, 560 (1857). This is very abundant in chalky cornfields, e.g., in Cambridgeshire. It is usually described as an erect plant; but, like all forms of "*P. aviculare L.*" it is prostrate or decumbent at maturity. Almost every form of "*P. aviculare L.*" has its small-leaved and small-fruited form; and the latter are often named "*P. microspermum*."

P. heterophyllum var. **litorale** Lindman *loc. cit.*; *P. litorale* Persoon *Syn.* i, 439, 385 (1805) non Meisner.—This is a hemi-halophytic form, the *P. aviculare* var. *litorale* of many botanists.

P. heterophyllum var. **cæspitosum** Lindman *loc. cit.*; *P. aviculare* var. *depressum* Meisner in DC. *Prodr.* xiv, 98 (1856) partim. Recorded by Professor Lindman from near Cambridge.

P. æquale Lindman *op. cit.* p. 692. Common, as far north as Forfarshire (!) at least, chiefly by waysides.

Professor Lindman points out that the plants are visited by small Diptera, and suggests that hybrids occur. This suggestion is, in my view, a very reasonable one.

P. calcatum Lindman in *Botan. Notiser* 139 (1904).—Professor Lindman last year sent me specimens of this plant; and I had no difficulty in recognising it, when I saw it on Arthur's Seat, near Edinburgh, last September. I sent a number of my specimens

to Professor Lindman ; and he replied :—" Your specimens are indeed *P. calcatum*, not the best I have seen, but quite safe." It grew near the roadside, among and almost hidden by the grass. It is best identified by its fruits, which are sub-bifacial with convex sides. It is a small, prostrate plant, nearer to *P. aequale* than to *P. heterophyllum*. It is an addition to the British flora.

Salicornia perennis var. **lignosa** comb. nov. ; *S. lignosa* Woods in *Bot. Gaz.* 31 (1851) ; Moss in *Journ. Bot.* xlix, 179 (1911).—After observing this plant for the last four years, I do not think it is sufficiently distinct from *S. perennis* (= *S. radicans*) to be allowed to retain specific rank. It is abundant on the western shore of Hayling Island, Hampshire, and was observed on the embankment there on the excursion on September 4th, 1911. I have seen it also in northern Algeria (near Oran), and in Brittany (the Bouche d'Erquy). It had previously been considered to be one of our endemic plants.

Salicornia dolichostachya sp. nov.—*S. (dolichostachya) colore viridi v. flavo-viridi* ; decumbens, flaccida v. subflaccida, saepius ramosissima ; 5-30 cm. alta ; segmentis brevibus vel longis ; spicis longissimis (etiam 8-16 cm. longis), nonnunquam curvatis, brevibus saepe ramis precipue ad basim, segmenta 15-30 exhibentibus. Differt ab omni alia specie annua quippe qua flores laterales inter se florem terminalem inclusum tenent perennium specierum ad instar.

In the accepted sub-divisions of the genus *Salicornia*, the distinction is made¹ that in the perennial species the lateral flowers are separated by the terminal one, whilst in the annual species the lateral flowers are not so separated : in the latter case, the central flower rests on the summits of the lateral flowers. *S. dolichostachya* is remarkable in being a bridging species in this regard, for, whilst it is an annual species, its lateral flowers are usually separated by the terminal one. That this is a very important character may be seen by observing the characters given in the definition of the sub-generic groups in all works where these are adopted. In addition to this character, *S. dolichostachya* may be recognised by its usually very "floppy" and decumbent habit, much branched, the branches tumbling over each other in a most disorderly way ; by its being the first species to come into flower (mid-August) and fruit (mid-September) ; and by its excessively long spikes, which are often

¹ It may be pointed out that this character also needs revision with regard to the many-flowered forms, e.g., *Salicornia australis*.

curved, and often branched especially at or near the base. I have had the plant under observation for three or four years. It is very abundant and typical on the shingle near high-water mark on the western shore of Hayling Island, where it grows to the exclusion of the other annual species. It was observed on the I.P.E. in Co. Dublin (*fide* Druce in *New Phyt.*, 318 (1911)) and on the northern shores of Hayling Island. A small form of it occurs on the salt-marshes at Blakeney, Norfolk; and I have seen specimens from Essex (H. and G. Groves) and from Devonshire (*via* Rev. E. S. Marshall). It also occurs in Spain (herb. C. Bailey) and Denmark (herb. Copenhagen).

The species of *Salicornia* are wind-pollinated; and hybrids are often abundant when allied species grow together. *S. dolichostachya*, for example, seems to hybridise with *S. herbacea* (= *S. europaea*) when the two plants grow together. I can only suppose the intermediate forms which occur in such places are hybrids, because they do not, according to my experience, occur when either species grows away from the other. Similarly, hybrids of *S. herbacea* and *S. ramosissima* occur, and doubtless of other species.

Salicornia dolichostachya × herbacea hybr. nov.—Hae plantæ medium locum tenent inter duas species a quibus nasci putantur, quibuscum etiam inveniuntur; colore viridi v. flavo-viridi; decumbens v. erecta, saepius ramosissima, 5-20 cm. alta; segmentis longis (circiter 3-6 cm.), plus minusve erecta, interdum ramos habentibus eodem more quo *S. dolichostachya* segmenta circiter 8-20 exhibentibus; flores laterales aut includunt aut non includunt florem centralem.

This was collected on the excursion to Hayling Island, on the salt-marsh on the north of the Island, growing along with the putative parents.

Salicornia disarticulata Moss *op. cit.* p. 183, t. 514. This also was observed in comparative abundance at Hayling Island. It was interesting to hear the comments of the foreign botanists on this newly described plant which I regard as a good "Benthamian species." One of them, with no leanings towards "Jordanian species," simply remarked:—"It is curious that such a plant has never been described before"! It is abundant in several salt-marshes on the northern shores of Brittany, and in southern Great Britain, is known from South Wales to Norfolk. It begins to flower, as a rule, on or about September 1st; and its disarticulating character—an

adaptation to seed-dispersal—may be observed during October and in early November.

Suaeda maritima var. **macrocarpa** Moquin *Chenop. Monogr.* *Enum.* 128 (1840); *Chenopodium macrocarpum* Desvaux *Journ.* i, 48 (1813); *Suaeda macrocarpa* Moquin in *Ann. Sci. Nat. ser. i, xxiii,* 309 (1831); *Chenopodina maritima* var. *macrocarpa* Moquin in *DC. Prodr.* xiii, 161 (1849).—This is the prevailing form of the species at Blakeney; and it was also observed at Hayling Island. It occurs abundantly on the Bouche d'Erquy, and in other salt-marshes in northern Brittany. It flowers earlier than the small-fruited form, and has thicker, shorter, and blunter leaves. It is probably commoner in the British Isles than the small-fruited form which also occurred at Hayling Island.

Ulmus campestris L. Several foreign members of the party promised to look out for the English elm on their return to their respective countries; but none has reported it. It is said to occur in Spain in certain of the royal parks.

I have elsewhere (*Gard. Chron.*, March 30th, April 6th and April 13th (1912)), given my reasons for restricting the name *U. campestris* to the English elm. A later name is *U. procera* *Salisbury Prodr.* 391 (1796). The small (*c.* 1·25 cm. long) suborbicular fruits of the tree are very characteristic, as well as the long, straight, stout trunk, the widely spreading lower branches (often lopped), and the leaves which are always rough above as in *U. glabra* Hudson (=*U. montana*) and suborbicular on the lower parts of each young branch.

Salix repens var. *argentea* Duby *Bot. Gall.* i, 424 (1828); *S. argentea* Smith *Fl. Brit.* 1059 (1804); *Eng. Bot. t.* 1364; *Eng. Fl.* iv, 207 (1828). This form of *S. repens* is often a social plant on sand-dunes, as near Southport. MM. Camus (*Classif. Saul.* 168 (1904)) elevate the plant to a sub-species and Mons. Rouy (*Fl. France* xii, 209 (1910)) to a "race," but Rouy only confuses matters by changing its name to *dunensis*, and by retaining a var. *argentea* which is not Smith's plant. The charge of inconsistency suggested by MM. Camus and by Mons. Rouy against Sir J. E. Smith, to the effect that the latter confused his *S. argentea* in any way, cannot be sustained. In my opinion the var. *laniata*, A. et G. Camus (=var. *argentea* Rouy) is a silvery-leaved form of var. *fusca*, which forms the passage from var. *fusca* to var. *argentea*. Apart from its strongly social habit, I cannot see why var. *argentea* should be elevated to a higher rank than var. *fusca*. MM. Camus

and M. Rouy do not give any flower or fruit characters which definitely separate the two plants. *S. repens* var. *fusca* is the prevailing form of the species on the fens of eastern England.

S. aurita × *cinerea* Wimmer in *Flora* xxxi, 330 (1848). See p. 361 (1912). This is one of the commonest hybrid-willows of the British Isles. One never fails to find several forms of it whenever the two species grow together. It was observed on the Excursion in Wessenden Clough, near Huddersfield. On the alkaline fens of eastern England, *S. aurita* does not occur, except on the acidic "Hochmoor" patches and margins; and when *S. aurita* is absent and *S. cinerea* is present (as on Wicken Fen, near Cambridge), the intermediates or putative hybrids do not occur.

Orchis maculata L. This is another variable species whose forms, as a whole, have not been studied by British botanists, although certain isolated ones have been more or less carefully described. One form has been named, as "a sub-species or ... species," *O. ericetorum*, by the Rev. E. F. Linton. These alternative grades which are given to plants by their authors are very troublesome to cite; and I think it is a good plan in all such cases to take the first suggested alternative as the one to be cited, and to ignore the second. This sub-species *ericetorum* Linton, then, is the form which was found in Crowden Clough, and is the usual British form on such siliceous and acidic soils. Mr. Druce maintains that it is the same as var. *præcox* Webster: if so, the varietal name chosen by this author is very inappropriate to the particular form which is abundant in northern England and in Scotland. A form of calcareous soils is var. *o'kelleyi* Druce, which was met with in Ireland, and which I have since found in a Cheshire fen. It is one of the characteristics of fens, as opposed to moors, that they harbour a considerable number of calcicolous species. The common plant of England, on chalky or clayey soils seems to be the var. *trilobata* of Rouy's *Fl. de France* xii, 152—4 (1911). Perhaps we have other forms also; and certainly we have a considerable number of forms which seem to be hybrids of the var. *præcox* and var *trilobatus*, and hybrids of each of these with *O. latifolia* and *O. ericetorum*.

Juncus bufonius var. *ranarius*; *J. ranarius* Songeon et Perrier in Billot *Annot Fl. Fr. et d'All* 192 (1855). I confess to a good deal of sympathy with Dr. Ostenfeld in regarding this as being not specifically distinct from *J. bufonius*. The var. *ranarius* should possess outer perianth-segments which are equal to or

scarcely longer than the capsules, and inner segments shorter than the capsule. Similarly, I should prefer to regard *J. gerardi* as a variety of *J. compressus*, rather than a separate species. In Ascherson and Graebner's *Fl. Nordostd. Flachl.* 175 (1898-9), *J. bufonius* and *J. ranarius* appear under the "Gesamtart" *J. bufonius*.

Zostera marina L. Both the type and the narrow-leaved form were abundant near the bridge leading to Hayling. The latter form is sometimes placed as a variety, sometimes as a hybrid of *Z. marina* and *Z. nana*; but all the narrow-leaved forms of *Z. marina* which I have seen *in situ* seem to be states related to habitat conditions. It may be that a hybrid also occurs which simulates the narrow-leaved form of *Z. marina*. *Z. nana* also occurred near Hayling Island: it seems to prefer less salty water than *Z. marina*.

Spartina townsendii H. and J. Groves in *Bot. Exch. Club Rep. for 1880*, 37 (1881); in *Journ. Bot.* xxi, t. 225 (1882); Stapf in *Gard. Chron.* ser. 3, xliii, 33 (1908). The ecology of the *Spartinetum townsendii* of the Hampshire coasts is well deserving of an intensive study. Personally, I do not regard it as occupying the place of any *Salicornietum* (cf. of *Brit. Veg. Types* p. 338); but as occupying a more outward or seaward zone. The extremely flat ground, the exceptionally soft mud, and the comparative absence of a tidal scour are special features of this habitat. At high tide, the *Spartinetum* resembles a reed-swamp of an open type. All *Salicornieta*, often reclaimed on this coast, occur on the landward margin of the *Spartinetum*; and a very extensive *Zosteretum marinæ* occurs on the sea-ward side of it. The *Zosteretum*, also, is a special feature of this coast, and, so far at least as its large extent is concerned, is a unique feature among English plant-associations, though the *Zosteretum* is well-represented on the shores of some of the maritime lochs of north-eastern Scotland.

The points of general interest in the above notes are here summarised:—

1. Whilst it may be true that there are numerous endemic forms of plants in the British Isles slightly different from forms on the mainland of Europe, this hypothesis has no claims to acceptance until the British plants in question have been very carefully compared with the nearest related forms of the European mainland.

2. The naming of a new, or presumably new, sub-specific form collected in a particular locality is, in general, undesirable, unless at the same time the form in question is compared with other known forms of the species, and the distinguishing characters of these forms also carefully delineated.

3. In some cases (e.g., *Stellaria dilleniana*), the polymorphism of a species is of such a nature that it seems undesirable to name, other than symbolically, the sub-specific forms which are known to occur.





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